4lp

CN-59408, SR 53

N63 84875

Code 5

NASA CR 51040

SMITHSONIAN INSTITUTION
ASTROPHYSICAL OBSERVATORY

Research in Space Science

SPECIAL REPORT

Number 53

December 5, 1960

CAMBRIDGE 38, MASSACHUSETTS

N63 84875

(NASA CR-51040) SAO Special ~~Report No. 53~~ Rept. - 53)

THE ORBITS AND THE ACCELERATIONS OF

SATELLITES 1959 α1 and 1959 α2

Research in Space Science

by

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(NASA Grant NsG-87-60)

Dec~~ember~~ 5, 1960 46 p 1 ref

8104903

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THE ORBITS AND THE ACCELERATIONS OF SATELLITES 1959 $\alpha 1$ and 1959 $\alpha 2$

by

Rajendra C. Nigam[1]

This paper gives the orbital information for Satellite 1959 $\alpha 1$ from the time it was launched on February 17, 1959, through March 31, 1960; and for Satellite 1959 $\alpha 2$ for the period from March 12, 1959, through March 31, 1960. An analysis of the acceleration of each satellite during the period indicated is included. Other parameters, such as the angle between the sun and the perigee (ψ), the latitude of perigee (Φ), etc., are also given.

Technical Data

Satellite 1959 $\alpha 1$ was launched by the National Aeronautics and Space Administration on February 17, 1959. Its purpose was to measure for a period of two weeks the cloud cover of the earth during the daylight portion of the satellite's orbit, in order to make possible a determination of the effect of the cloud cover on general meteorological conditions (National Aeronautics and Space Administration, 1959). The satellite was a sphere twenty inches in diameter and 21.74 pounds in weight. Its radio transmitter, which broadcast on 107.993 mc/sec, operated until 1400 hours U.T. on March 15, 1959.

Satellite 1959 $\alpha 2$ was the rocket of Vanguard II. The object was a cylinder four feet in length, 20 inches in diameter, and 50 pounds in weight.

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SAO Mean Elements

The SAO mean elements should be clearly distinguished from the mean elements as used in the classical sense of celestial mechanics. As already pointed out by Zadunaisky (1960), these SAO elements are "mean" in two senses. First, the short-periodic perturbations due to the oblateness of the earth have been subtracted from the observations. Second, the elements represent observations distributed over a period of several days. Furthermore, the elements are represented by appropriate polynomial expressions instead of by constants. From the initial conditions of launch of a satellite, we have a rough approximation for the values of the argument of perigee (ω), the right ascension of the node (Ω), the inclination (i), the eccentricity (e), the mean motion (n), and the mean anomaly (M) at some specific time. The first derivatives of ω and Ω, which are well-known perturbations of the advance of perigee and the regression of node that are caused by the oblateness of the earth, are computed from the equations

$$\dot{\omega} = \frac{nJ}{a^2(1 - e^2)^2} \left(2 - \frac{5}{2} \sin i\right), \quad \text{and}$$

$$\dot{\Omega} = - \frac{nJ}{a^2(1 - e^2)^2} \cos i \; .$$

The second derivatives of ω and Ω, which represent small perturbations of atmospheric origin, are then evaluated from

$$\ddot{\omega} = \frac{\dot{n}}{n} \left(1 + \frac{4}{3} \cdot \frac{1 - e}{1 + e}\right) \dot{\omega} \; , \quad \text{and}$$

$$\ddot{\Omega} = \frac{\dot{n}}{n} \left(1 + \frac{4}{3} \cdot \frac{1 - e}{1 + e}\right) \dot{\Omega} \; ,$$

where n represents the mean motion defined as the number of revolutions made by the satellite in one day. The first derivative of the mean anomaly (M) represents the mean motion (n) of the satellite. Because of atmospheric drag, the mean motion tends to increase; this effect, known as acceleration ($\dot{n}$), is taken into account by the presence of a quadratic term in the expression for the mean anomaly. The eccentricity (e) decreases secularly because of atmospheric drag; it is therefore expressed as a linear function of time, $\dot{e}$ being evaluated from the equation

$$\dot{e} = - \frac{2}{3} \frac{1 - e}{n} \dot{n} \; .$$

The secular perturbation on inclination (i) is very small; we therefore express i as a constant term.

These polynomial expressions for ω, Ω, i, e, and M are our input to the IBM-704 for the Veis-Moore Differential Orbit Improvement Program. The orbit is thus corrected to satisfy the observed positions of the satellite, and only the elements that are provided with values of standard errors have been varied.

Satellite 1959 α1. -- A total of 3325 observations were used to derive the SAO mean elements in Table 1; 62 percent of these were field-reduced Baker-Nunn observations, 16 percent Minitrack, and 22 percent Moonwatch and other types of observations. These elements were computed every two days, using observations ± 4 days from the epoch.

Satellite 1959 α2. -- A total of 2720 observations were used to derive the SAO mean elements in Table 3; 63 percent of these were field-reduced Baker-Nunn observations, and 37 percent Moonwatch and other types of observations. These elements were computed every two days, using observations ± 4 days from the epoch.

SAO Smoothed Elements

The smoothed elements are expressed as the sum of a polynomial and a sine (or cosine) term for the third harmonic in the potential of the earth. A quadratic polynomial for each of the elements, argument of perigee (ω), right ascension of the node (Ω), and mean anomaly (M), is first obtained by a least-squares fit to the SAO mean elements. A linear expression for eccentricity (e) is found in a similar way, and an average value of the inclination (i) is taken for our initial orbit.

To these polynomial expressions, a sine (or cosine) term due to the third harmonic term in the potential of the earth is added; the coefficients are evaluated from the expressions given by Kozai (1959).

These expressions for ω, Ω, i, e, and M are our input to the IBM-704 for the Veis-Moore Differential Orbit Improvement Program. The orbit is corrected to satisfy the observed positions of the satellite during the interval under consideration. The elements that are provided with values of standard errors have been varied, while the other elements have been kept constant.

Satellite 1959 $\alpha 1$ (Vanguard II)

I. *SAO smoothed elements*

The following elements are based on 531 Minitrack and field-reduced Baker-Nunn observations and are valid for the period from February 17 through March 24, 1959.

$$T_o = 36630.0 \text{ MJD}$$
$$\omega = (205^\circ.607 \pm 11) + (5^\circ.2605 \pm 8)\,t + {}^\circ.45 \times 10^{-3} t^2 + ({}^\circ.186 \pm 15) \cos \omega$$
$$\Omega = (135^\circ.841 \pm 6) - (3^\circ.4984 \pm 5)\,t - {}^\circ.238 \times 10^{-3} t^2 + ({}^\circ.046 \pm 9) \cos \omega$$
$$i = (32^\circ.8795 \pm 8) - ({}^\circ.0137 \pm 13) \sin \omega$$
$$e = (.16568 \pm 1) - .5 \times 10^{-5} t + (.369 \pm 15) \times 10^{-3} \sin \omega$$
$$M = (.521817 \pm 45) + (11.443009 \pm 3)\,t + (.5249 \pm 18) \times 10^{-4} t^2 - (.494 \pm 57) \times 10^{-3} \cos \omega$$

Standard error of one observation : $\sigma = \pm 4''.0$.

The following elements are based on 209 field-reduced Baker-Nunn observations and are valid for the period from March 25 through April 25, 1959.

$$T_o = 36670.0 \text{ MJD}$$
$$\omega = (56^\circ.015 \pm 53) + (5^\circ.264 \pm 5)\,t + {}^\circ.46 \times 10^{-4} t^2 + ({}^\circ.22 \pm 7) \cos \omega$$
$$\Omega = (355^\circ.876 \pm 23) - (3^\circ.506 \pm 2)\,t - {}^\circ.307 \times 10^{-4} t^2 - ({}^\circ.08 \pm 3) \cos \omega$$
$$i = (32^\circ.892 \pm 3) - ({}^\circ.0295 \pm 50) \sin \omega$$
$$e = (.165538 \pm 37) - .45 \times 10^{-5} t + (.29 \pm 5) \times 10^{-3} \sin \omega$$
$$M = (.33960 \pm 17) + (11.448238 \pm 15)\,t + (.693 \pm 3) \times 10^{-4} t^2 + (.69 \pm 23) \times 10^{-3} \cos \omega$$

Standard error of one observation : $\sigma = \pm 4''.8$.

The orbital elements for the period from April 26 through August 25, 1959, have already been published in SAO Special Reports 28, page 5; and 40 (R), page 18.

The following elements are based on 108 field-reduced Baker-Nunn observations and are valid for the period from August 26 through September 30, 1959.

$$T_o = 36820.0 \text{ MJD}$$
$$\omega = (126^\circ.600 \pm 35) + (5^\circ.266 \pm 35)\,t + {}^\circ.462 \times 10^{-4} t^2 + {}^\circ.140 \cos \omega$$
$$\Omega = (190^\circ.008 \pm 12) - (3^\circ.5068 \pm 13)\,t - {}^\circ.3067 \times 10^{-4} t^2 + {}^\circ.012 \cos \omega$$
$$i = (32^\circ.8781 \pm 36) - {}^\circ.006 \sin \omega$$
$$e = (.165293 \pm 34) - .2306 \times 10^{-5} t + .424 \times 10^{-3} \sin \omega$$
$$M = (.581067 \pm 75) + (11.458979 \pm 7)\,t + (.1461 \pm 11) \times 10^{-4} t^2$$

Standard error of one observation : $\sigma = \pm 7''.3$.

The following elements are based on 108 field-reduced Baker-Nunn observations and are valid for the period from October 1 through October 31, 1959.

$$T_o = 36855.0 \text{ MJD}$$

$$\omega = (311\overset{\circ}{.}078 \pm 33) + (5\overset{\circ}{.}2832 \pm 41)\, t + \overset{\circ}{.}462 \times 10^{-4} t^2 + \overset{\circ}{.}140 \cos \omega$$

$$\Omega = (67\overset{\circ}{.}222 \pm 10) - 3\overset{\circ}{.}5090\, t - \overset{\circ}{.}3067 \times 10^{-4} t^2 + \overset{\circ}{.}012 \cos \omega$$

$$i = (32\overset{\circ}{.}8912 \pm 30) - \overset{\circ}{.}006 \sin \omega$$

$$e = (.165211 \pm 24) - .2306 \times 10^{-5} t + .42 \times 10^{-3} \sin \omega$$

$$M = (.663019 \pm 72) + (11.459907 \pm 9)\, t + (.136 \pm 0) \times 10^{-4} t^2$$

Standard error of one observation : $\sigma = \pm 5\overset{''}{.}8$.

The following elements are based on 118 field-reduced Baker-Nunn observations and are valid for the period from November 1 through November 30, 1959.

$$T_o = 36887.0 \text{ MJD}$$

$$\omega = (125\overset{\circ}{.}160 \pm 20) + (5\overset{\circ}{.}2726 \pm 16)\, t + \overset{\circ}{.}1056 \times 10^{-4} t^2 + \overset{\circ}{.}140 \cos \omega$$

$$\Omega = (311\overset{\circ}{.}455 \pm 7) - (3\overset{\circ}{.}5103 \pm 8)\, t - \overset{\circ}{.}702 \times 10^{-5} t^2 + \overset{\circ}{.}012 \cos \omega$$

$$i = (32\overset{\circ}{.}8694 \pm 25) - \overset{\circ}{.}006 \sin \omega$$

$$e = (.165193 \pm 29) - .114 \times 10^{-5} t + .424 \times 10^{-3} \sin \omega$$

$$M = (.854669 \pm 46) + (11.460706 \pm 3)\, t + (.793 \pm 6) \times 10^{-5} t^2$$

Standard error of one observation: $\sigma = \pm 3\overset{''}{.}5$.

The following elements are based on 96 field-reduced Baker-Nunn observations and are valid for the period from December 1 through December 31, 1959.

$$T_o = 36918.0 \text{ MJD}$$

$$\omega = (283.534 \pm 17) + (5\overset{\circ}{.}2817 \pm 19)\, t + \overset{\circ}{.}1056 \times 10^{-4} t^2 + \overset{\circ}{.}140 \cos \omega$$

$$\Omega = (206\overset{\circ}{.}123 \pm 8) - (3\overset{\circ}{.}5112 \pm 11)\, t - \overset{\circ}{.}702 \times 10^{-5} t^2 + \overset{\circ}{.}012 \cos \omega$$

$$i = (32\overset{\circ}{.}8681 \pm 27) - \overset{\circ}{.}006 \sin \omega$$

$$e = (.164899 \pm 71) - .114 \times 10^{-5} t + .424 \times 10^{-3} \sin \omega$$

$$M = (.683494 \pm 41) + (11.461249 \pm 5)\, t + (.889 \pm 7) \times 10^{-5} t^2$$

Standard error of one observation: $\sigma = \pm 2\overset{''}{.}3$.

The following elements are based on 86 field-reduced Baker-Nunn observations and are valid for the period from January 1 through January 31, 1960.

$T_o = 36948.0$ MJD

$\omega = (81^\circ\!.771 \pm 19) + (5^\circ\!.2725 \pm 16)\, t + {}^\circ\!.105 \times 10^{-4} t^2 + {}^\circ\!.140 \cos \omega$

$\Omega = (100^\circ\!.858 \pm 8) - (3^\circ\!.5094 \pm 8)\, t - {}^\circ\!.702 \times 10^{-5} t^2 + {}^\circ\!.012 \cos \omega$

$i = (32^\circ\!.8881 \pm 28) - {}^\circ\!.006 \sin \omega$

$e = (.165160 \pm 44) - .114 \times 10^{-5} t + .424 \times 10^{-3} \sin \omega$

$M = (.529624 \pm 36) + (11.461812 \pm 3)\, t + (.832 \pm 6) \times 10^{-5} t^2$

Standard error of one observation : $\sigma = \pm 5'\!.6$.

The following elements are based on 368 field-reduced Baker-Nunn observations and are valid for the period from February 1 through March 31, 1960.

$T_o = 36994.0$ MJD

$\omega = (324^\circ\!.406 \pm 7) + (5^\circ\!.2789 \pm 5)\, t + {}^\circ\!.1056 \times 10^{-4} t^2 + ({}^\circ\!.169 \pm 12) \cos \omega$

$\Omega = (299^\circ\!.391 \pm 5) - (3^\circ\!.5114 \pm 3)\, t - {}^\circ\!.702 \times 10^{-5} t^2 + ({}^\circ\!.051 \pm 8) \cos \omega$

$i = (32^\circ\!.8703 \pm 18) - ({}^\circ\!.014 \pm 2) \sin \omega$

$e = (.165259 \pm 44) - .114 \times 10^{-4} t + (.94 \pm 5) \times 10^{-3} \sin \omega$

$M = (.793689 \pm 17) + (11.462704 \pm 1)\, t + (.900 \pm 6) \times 10^{-5} t^2 - (.468 \pm 26) \times 10^{-3} \cos \omega$

Standard error of one observation : $\sigma = \pm 4'\!.5$.

Estimated date of demise : 1986.

Satellite 1959 $\alpha 2$ (Vanguard II Rocket)

I. SAO smoothed elements

The following elements are based on 430 field-reduced Baker-Nunn observations and are valid for the period from March 12 through April 25, 1959.

$$T_o = 36660.0 \text{ MJD}$$

$$\omega = (349°763 \pm 21) + (4°9246 \pm 12)\, t + °766 \times 10^{-4} t^2 + °124 \cos \omega$$

$$\Omega = (40°339 \pm 7) - (3°2796 \pm 5)\, t - °509 \times 10^{-4} t^2 + °013 \cos \omega$$

$$i = (32°9317 \pm 27) - °007 \sin \omega$$

$$e = (.183814 \pm 33) - .5602 \times 10^{-5}\, t + .406 \times 10^{-3} \sin \omega$$

$$M = (.62165 \pm 7) + (11.071795 \pm 4)\, t + (.6474 \pm 5) \times 10^{-4} t^2 - .2 \times 10^{-3} \cos \omega$$

Standard error of one observation: $\sigma = \pm 6'6$.

The orbital elements for the period from April 26 through August 25, 1959, have already been published in SAO Special Reports 28, page 6; and 40 (R), page 19.

The following elements are based on 80 field-reduced Baker-Nunn observations and are valid for the period from August 26 through September 30, 1959.

$$T_o = 36820.0 \text{ MJD}$$

$$\omega = (59°344 \pm 24) + (4°9259 \pm 20)\, t + °1087 \times 10^{-4} t^2 + °123 \cos \omega$$

$$\Omega = (234°7310 \pm 85) - (3°2864 \pm 12)\, t - °723 \times 10^{-5} t^2 + °013 \cos \omega$$

$$i = (32°9160 \pm 32) - °007 \sin \omega$$

$$e = (.183839 \pm 48) - .1248 \times 10^{-5}\, t + .415 \times 10^{-3} \sin \omega$$

$$M = (.342192 \pm 44) + (11.084550 \pm 4)\, t + (.2055 \pm 9) \times 10^{-4} t^2$$

Standard error of observation: $\sigma = \pm 5'9$.

The following elements are based on 40 field-reduced Baker-Nunn observations and are valid for the period from October 1 through October 31, 1959.

$$T_o = 36856.0 \text{ MJD}$$

$$\omega = (237°145 \pm 56) + (4°9447 \pm 35)\, t + °1087 \times 10^{-4} t^2 + °123 \cos \omega$$

$$\Omega = (116°332 \pm 15) - (3°2898 \pm 17)\, t - °723 \times 10^{-5} t^2 + °013 \cos \omega$$

$$i = (32°9299 \pm 67) - °007 \sin \omega$$

$$e = (.183693 \pm 61) - .1248 \times 10^{-5}\, t + .415 \times 10^{-3} \sin \omega$$

$$M = (.410223 \pm 12) + (11.085758 \pm 7)\, t + (.1161 \pm 11) \times 10^{-4} t^2$$

Standard error of one observation: $\sigma = \pm 8'2$.

The following elements are based on 62 field-reduced Baker-Nunn observations and are valid for the period from November 1 through November 30, 1959.

$$
\begin{aligned}
T_o &= 36888.0 \text{ MJD} \\
\omega &= (35^{\circ}.257 \pm 24) + (4^{\circ}.9346 \pm 26)\, t + {}^{\circ}.618 \times 10^{-5} t^2 + {}^{\circ}.123 \cos \omega \\
\Omega &= (11^{\circ}.080 \pm 9) - (3^{\circ}.2875 \pm 8)\, t - {}^{\circ}.723 \times 10^{-5} t^2 + {}^{\circ}.013 \cos \omega \\
i &= (32^{\circ}.932 \pm 2) - {}^{\circ}.007 \sin \omega \\
e &= (.183557 \pm 2) - .1248 \times 10^{-5} t + .415 \times 10^{-3} \sin \omega \\
M &= (.167951 \pm 48) + (11.086615 \pm 6)\, t + (.1123 \pm 8) \times 10^{-4} t^2
\end{aligned}
$$

Standard error of one observation : $\sigma = \pm 2''.1$.

The following elements are based on 124 field-reduced Baker-Nunn observations and are valid for the period from December 1 through December 31, 1959.

$$
\begin{aligned}
T_o &= 36918.0 \text{ MJD} \\
\omega &= (183.462 \pm 24) + (4^{\circ}.9443 \pm 16)\, t + {}^{\circ}.618 \times 10^{-5} t^2 + {}^{\circ}.123 \cos \omega \\
\Omega &= (272^{\circ}.4160 \pm 71) - (3^{\circ}.2897 \pm 8)\, t - {}^{\circ}.723 \times 10^{-5} t^2 + {}^{\circ}.013 \cos \omega \\
i &= (32^{\circ}.908 \pm 3) - {}^{\circ}.007 \sin \omega \\
e &= (.183556 \pm 34) - .1248 \times 10^{-5} t + .415 \times 10^{-3} \sin \omega \\
M &= (.776313 \pm 50) + (11.087212 \pm 4)\, t + (.5915 \pm 60) \times 10^{-5} t^2
\end{aligned}
$$

Standard error of one observation : $\sigma = \pm 3''.7$.

The following elements are based on 63 field-reduced Baker-Nunn observations and are valid for the period from January 1 through January 31, 1960.

$$
\begin{aligned}
T_o &= 36948.0 \text{ MJD} \\
\omega &= (331^{\circ}.795 \pm 20) + (4^{\circ}.9431 \pm 13)\, t + {}^{\circ}.618 \times 10^{-5} t^2 + {}^{\circ}.123 \cos \omega \\
\Omega &= (173^{\circ}.695 \pm 7) - (3^{\circ}.2909 \pm 7)\, t - {}^{\circ}.723 \times 10^{-5} t^2 + {}^{\circ}.013 \cos \omega \\
i &= (32^{\circ}.922 \pm 2) - {}^{\circ}.007 \sin \omega \\
e &= (.183514 \pm 23) - .1248 \times 10^{-5} t + .415 \times 10^{-3} \sin \omega \\
M &= (.399499 \pm 40) + (11.087726 \pm 3)\, t + (.9746 \pm 47) \times 10^{-5} t^2
\end{aligned}
$$

Standard error of one observation : $\sigma = \pm 3''.5$.

The following elements are based on 304 field-reduced Baker-Nunn observations and are valid for the period from February 1 through March 31, 1960.

T_o = 36994.0 MJD

$\omega = (199\overset{\circ}{.}064 \pm 9) + (4\overset{\circ}{.}9398 \pm 4)\, t + \overset{\circ}{.}618 \times 10^{-5} t^2 + \overset{\circ}{.}123 \cos \omega$

$\Omega = (22\overset{\circ}{.}373 \pm 4) - (3\overset{\circ}{.}2897 \pm 2)\, t - \overset{\circ}{.}723 \times 10^{-5} t^2 + \overset{\circ}{.}013 \cos \omega$

$i = (32\overset{\circ}{.}9214 \pm 13) - \overset{\circ}{.}007 \sin \omega$

$e = (.183483 \pm 26) - .1248 \times 10^{-5} t + .415 \times 10^{-3} \sin \omega$

$M = (.455025 \pm 22) + (11.088469 \pm 1)\, t + (.464 \pm 4) \times 10^{-5} t^2 - \overset{\circ}{.}68 \times 10^{-3} \cos \omega$

Standard error of one observation : $\sigma = \pm 3'\!.0$.

Estimated date of demise : 1999.

Acceleration

We define the acceleration as the rate of change of the mean motion (n), which is the number of revolutions made by the satellite in one day. The acceleration is therefore denoted by ($\dot{n}$). However, it has been more convenient to print $\frac{\dot{n}}{2}$ instead of n in the results of SAO mean elements.

To relate satellite drag to orbital elements and atmospheric parameters, we use the formula developed by D. G. King-Hele, G. E. Cook, and D. M. C. Walker (1959):

$$\rho_p \sqrt{H_p} = -\frac{\sqrt{2/\pi}}{3C_D} \left(\frac{dP}{dt}\right) \frac{m}{AF} \sqrt{\frac{e}{a}} \left[1 - 2e + \frac{5e^2}{2} - \frac{H}{8ae} \left(1 - 10e + \frac{7H}{16ae}\right)\right] \qquad (1)$$

Next, we employ the formula developed by Jacchia (1960),

$$\rho \sqrt{H} = f_o(z)\, F_{20} \left\{1 + 0.185 \left[\exp(.006z) - 2\right] \cos^6 \frac{\psi'}{2} \right\}, \qquad (2)$$

where the approximation

$$\log f_o(z) = -12.475 - 0.0019z + 6.01 \exp(-.0027z)$$

is used in the interval 200 km $< z <$ 700 km.

No attempt has been made to modify the coefficients or the exponent in equation (2), except that instead of $\frac{dP}{dt}$ as used by Jacchia (obtained by the numerical differentiation of the periods derived from the mean motion) we use the acceleration that comes directly as output from the DOI program. The rate of change of the period is given by the equation

$$\dot{P} = - \frac{\dot{n}}{n^2} \tag{3}$$

As pointed out by Jacchia (1960), the difficulties involved in the computation of reliably accurate accelerations are considerable. The author therefore feels that in the absence of a quick and direct method for the determination of instantaneous accelerations, we are equally well off in using the accelerations obtained directly from the DOI program. With this object in view, the author is attempting to analyze the accelerations of a few satellites along the line of thought initiated by Jacchia (1960).

Satellite 1959 $\alpha 1$. -- Figure 1 is a result of this investigation for the Satellite 1959 $\alpha 1$. A phase lag of 30° in ψ' has been used. In spite of the fact that we have retained in equation (2) all the coefficients and the exponent of cos $\frac{\psi'}{2}$ (which were derived empirically to explain the accelerations obtained by numerical differention of the periods), the general trend of the change in the accelerations has been preserved. The results further strengthen and confirm the concept of the diurnal bulge as proposed and developed by Jacchia (1960). Using the acceleration data of other satellites, we are continuing to examine this concept; the results will be published later.

Figure 2 gives the residuals of the mean motion when a quadratic expression has been taken out. When superposed in Figure 3 on the graph of ψ, the angle between sun and the perigee, this curve does show a phase lag between ψ and the acceleration, an exact determination of which does not appear to be too difficult with a more elaborate study and analysis of the acceleration.

Satellite 1959 $\alpha 2$. -- For a satellite with perigee height as high as 560 km, the average for 1959 $\alpha 2$, the acceleration due to tumbling can be ignored. Since the orbital characteristics for this satellite are very similar to those of 1959 $\alpha 1$, we have employed the same equation without altering any of the coefficients. The result is shown in Figure 7. The remarkable similarity between these results and those obtained for 1959 $\alpha 1$ justifies the initial assumption that the tumbling due to the non-spherical shape of the satellite has very little effect on the overall motion of the satellite. The concept of the diurnal bulge is thus

further confirmed by the study of the orbit of this non-spherical satellite.

Other Data

The program of P. E. Zadunaisky was used to compute the angle between the sun and the perigee (Ψ), the latitude of the perigee (Φ), the difference in the right ascension of perigee and sun (D.R.A.) and the correction of the perigee height (C), in order to obtain the actual height (Z) over the international ellipsoid. The accelerations ($-\dot{P}$), defined as the rate of change of period and evaluated from equation (3), are also given. In figures 5 and 10, the curve for $c = \frac{ae}{297} \sin^2\Phi$ gives the correction needed to derive true altitude $z = q - ae + c$, of the perigee over the international ellipsoid, where ae is earth's equatorial radius and q is the geocentric distance of perigee.

Satellite 1959 $\alpha 1$. -- In Table 2, the elements $-\dot{P}$, Z, Φ, D.R.A., Ψ, and C are given at two-day intervals starting from launch. The quantities Φ and C are plotted in Figures 4 and 5. Figure 6 contains the 20-cm solar flux data for the interval under consideration.

Satellite 1959 $\alpha 2$. -- In Table 4 are tabulated the elements $-\dot{P}$, Z, ϕ, D.R.A., Ψ, and C at two-day intervals from March 13 through April 7, 1960. The quantities Ψ, Φ, and C are plotted in Figures 8, 9, and 10.

The analysis of individual elements of 1959 $\alpha 1$, e.g. inclination (i), geocentric perigee distance (q), etc., is already in progress, as is an investigation of the diurnal bulge based on the acceleration data of other satellites; the results will be published in a subsequent report.

Acknowledgements

The author wishes to thank Dr. L. G. Jacchia, for encouraging us to use his result on the diurnal bulge to analyze the acceleration of the non-spherical Satellite 1959 $\alpha 2$; and Mr. J. D. de Clercq Zubli, who assisted in the computations.

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TABLE 1

MEAN ORBITAL ELEMENTS OF SATELLITE 1959 $\alpha 1$

T (MJD)	ω	Ω	i	e	M	n	n'	a	N	D	σ
36618.0	142.32 5	177.62 4	32.880 4	.1659 1	.2142 1	11.44164 8	.6E-4 1	6.938148	60	8	1.25
36620.0	152.91 1	170.744 8	32.882 2	.16584 4	1.09745 4	11.44198 2	.47E-4 2	6.938102	72	8	.49
36622.0	163.40 2	163.76 2	32.884 2	.16591 4	1.98156 4	11.44216 2	.45E-4 2	6.937494	69	8	.47
36624.0	173.867 8	156.801 6	32.875 2	.16583 3	2.86608 3	11.44241 1	.52E-4 1	6.938033	78	8	.43
36626.0	184.375 5	149.793 3	32.882 2	.16578 2	3.75105 2	11.44260 9	.567E-4 8	6.938329	83	8	.32
36628.0	194.878 5	142.786 3	32.885 2	.16571 2	4.63651 2	11.442834 7	.542E-4 7	6.938825	90	8	.37
36630.0	205.391 8	135.776 5	32.892 3	.16564 3	5.52240 2	11.44299 1	.505E-4 8	6.939328	88	8	.50
36632.0	215.953 9	128.785 6	32.894 3	.16550 3	6.40857 2	11.44319 1	.489E-4 8	6.940423	77	8	.44
36634.0	226.50 1	121.802 9	32.890 4	.16544 3	7.29514 3	11.44336 1	.486E-4 6	6.940923	121	8	.47
36636.0	237.092 9	114.807 6	32.891 3	.16532 2	8.18206 2	11.443597 9	.498E-4 5	6.941774	60	8	.30
36638.0	247.66 1	107.805 7	32.893 4	.16526 2	9.06943 2	11.44379 1	.545E-4 5	6.94223	59	8	.32
36640.0	258.23 3	100.81 1	32.894 5	.16521 3	9.95724 4	11.44402 3	.570E-4 7	6.942505	46	8	.35
36642.0	268.745 6	93.822 4	32.901 2	.16522 2	10.84560 1	11.444280 9	.587E-4 8	6.94230	119	8	.63
36644.0	279.23 1	86.840 6	32.904 4	.16526 3	11.73449 4	11.44456 2	.64E-4 2	6.9[illegible]1934	90	8	1.00
36646.0	289.78 2	79.844 7	32.905 5	.16526 4	12.62380 8	11.44478 2	.64E-4 2	6.941789	51	8	1.09
36648.0	300.34 2	72.858 6	32.904 3	.16529 3	13.51349 8	11.44503 3	.70E-4 1	6.941486	42	8	.83
36650.0	310.91 3	65.851 9	32.897 4	.16530 4	14.40382 8	11.44538 5	.68E-4 3	6.941245	32	8	.80
36652.0	321.44 2	58.858 8	32.898 2	.16537 3	15.29475 6	11.44560 2	.84E-4 1	6.940548	42	8	.71
36654.0	332.02 1	51.859 6	32.894 2	.16542 2	16.18624 4	11.44594 2	.829E-4 7	6.940022	42	8	.47
36656.0	342.57 2	44.858 7	32.894 2	.16545 2	17.07850 5	11.44631 2	.65E-4 1	6.939586	47	8	.61
36658.0	353.07 1	37.870 4	32.891 1	.16553 2	17.97142 4	11.44660 1	.669E-4 6	6.938861	57	8	.46

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36660.0	3.60 1	30.870 5	32.888 1	.16561 2	18.86483 5	11.44688 1	.669E-4 7	6.938029	59	8	.56
36662.0	14.12 2	23.873 6	32.887 2	.16572 3	19.75877 5	11.44715 2	.63E-4 1	6.937029	69	8	.74
36664.0	24.59 4	16.87 1	32.884 4	.16565 6	20.6534 1	11.44731 3	.61E-4 2	6.937537	81	8	1.76
36666.0	35.11 3	9.87 1	32.878 4	.16573 7	21.5483 1	11.44763 3	.70E-4 2	6.936735	78	8	1.88
36668.0	45.62 2	3.06 2	32.768 7	.1663 1	22.44338 5	11.44798 1	.61E-4 6	6.931871	82	8	6.95
36670.0	56.06 3	356.02 2	32.759 7	.1663 2	23.33970 9	11.44829 9	.62E-4 7	6.931714	68	8	6.99
36672.0	66.74 4	349.10 2	32.755 8	.1663 2	24.2355 2	11.44836 7	.84E-4 5	6.931426	64	8	7.85
36674.0	77.32 6	341.93 3	32.85 1	.1666 2	25.1330 2	11.44897 5	.57E-4 5	6.928984	40	8	3.38
36676.0	87.60 2	334.863 8	32.864 3	.16606 6	26.03152 6	11.44904 2	.68E-4 2	6.933471	38	8	.79
36678.0	98.11 2	327.86 1	32.862 5	.16608 8	26.92977 8	11.44930 2	.63E-4 2	6.933127	37	8	1.09
36680.0	108.60 2	320.844 6	32.861 3	.16586 5	27.82860 5	11.44954 1	.69E-4 1	6.934867	33	8	.62
36682.0	119.08 3	313.84 1	32.858 7	.1658 1	28.72801 9	11.44980 2	.76E-4 2	6.935582	34	8	1.32
36684.0	129.60 3	306.83 1	32.858 7	.1657 1	29.6280 1	11.45011 2	.73E-4 2	6.936125	28	8	1.34
36686.0	140.16 2	299.819 5	32.865 3	.16571 6	30.52841 5	11.45041 1	.755E-4 8	6.935756	26	8	.60
36688.0	150.67 3	292.810 1	32.860 7	.1656 1	31.42966 9	11.45072 2	.70E-4 2	6.936773	30	8	1.46
36690.0	161.23 3	285.79 2	32.860 8	.1657 1	32.33133 8	11.45104 3	.61E-4 2	6.935846	33	8	1.59
36692.0	171.76 3	278.78 2	32.863 7	.16564 9	33.23356 7	11.45125 2	.61E-4 2	6.936007	39	8	1.55
36694.0	182.30 3	271.76 2	32.864 6	.16552 9	34.13632 7	11.45148 2	.59E-4 3	6.936904	37	8	1.51
36696.0	192.83 3	264.77 2	32.869 7	.1655 1	35.03950 8	11.45170 2	.56E-4 2	6.937275	35	8	1.68
36698.0	203.40 2	257.76 1	32.872 3	.16530 6	35.94311 3	11.45195 1	.60E-4 1	6.938604	38	8	1.06
36700.0	215.94 2	250.76 1	32.875 3	.16519 8	36.84723 3	11.45220 1	.599E-4 8	6.939385	44	8	1.12
36702.0	224.48 2	243.76 1	32.875 4	.1652 1	37.75188 4	11.45243 2	.60E-4 2	6.939607	53	8	1.48
36704.0	235.05 2	236.75 1	32.876 3	.1651 1	38.65695 4	11.45263 1	.53E-4 1	6.939727	65	8	1.62
36706.0	245.61 2	229.74 1	32.877 4	.1651 1	39.56247 4	11.45284 1	.46E-4 2	6.940042	64	8	1.65
36708.0	256.18 1	222.73 1	32.875 3	.1650 1	40.46834 3	11.45305 2	.41E-4 2	6.940744	54	8	1.37
36710.0	266.72 1	215.715 9	32.876 3	.16503 8	41.37465 2	11.453226 1	.401E-4 1	6.940302	53	8	1.38
36712.0	277.27 1	208.706 7	32.878 3	.16506 6	42.28122 2	11.453372 9	.395E-4 8	6.939989	47	8	1.13
36714.0	287.81 2	201.694 8	32.879 3	.16509 7	43.18817 3	11.45354 1	.35E-4 1	6.939675	48	8	1.16
36716.0	298.37 2	194.68 1	32.878 4	.16511 8	44.09532 4	11.45361 2	.27E-4 2	6.93946	58	8	1.27
36718.0	308.97 2	187.666 8	32.880 3	.16509 9	45.00260 3	11.45369 1	.20E-4 1	6.939613	62	8	1.00

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36720.0	319.55 2	180.66 1	32.883 4	.16497 1	45.91003 4	11.45383 2	.22E-4 1	6.94053	73	8	1.40
36722.0	330.10 2	173.65 1	32.882 3	.1649 1	46.81778 5	11.45396 2	.25E-4 2	6.941127	72	8	1.41
36724.0	340.62 2	166.64 1	32.884 2	.1652 1	47.72577 4	11.45407 2	.30E-4 1	6.938979	113	8	1.73
36726.0	351.19 1	159.634 7	32.883 2	.16523 6	48.63387 3	11.45417 1	.309E-4 9	6.938258	70	8	1.07
36728.0	1.72 1	152.624 6	32.884 2	.16536 5	49.54233 2	11.45427 1	.373E-4 9	6.937149	77	8	.99
36730.0	12.266 8	145.613 5	32.882 1	.16543 4	50.45102 2	11.454429 8	.377E-4 5	6.936452	86	8	.86
36732.0	22.804 8	138.601 5	32.882 1	.16548 4	51.35999 2	11.454583 7	.390E-4 6	6.934671	81	8	.81
36734.0	33.333 9	131.586 6	32.882 2	.16575 5	52.26932 2	11.454758 8	.408E-4 7	6.933721	76	8	.92
36736.0	43.864 9	124.575 6	32.881 2	.16585 5	53.17897 3	11.454926 9	.416E-4 8	6.932811	64	8	.92
36738.0	54.38 1	117.555 7	32.882 2	.16590 6	54.08899 3	11.455091 9	.418E-4 1	6.932281	51	8	.96
36740.0	64.900 9	110.542 6	32.881 2	.16590 5	54.99934 2	11.455247 7	.430E-4 8	6.932265	43	8	.81
36742.0	75.412 6	103.535 4	32.882 1	.16590 4	55.91003 1	11.455435 6	.408E-4 8	6.932199	30	8	.45
36744.0	85.931 9	96.521 7	32.883 2	.16579 7	56.82103 2	11.455570 8	.38E-4 1	6.933069	29	8	.78
36746.0	96.435 6	89.519 5	32.885 1	.16576 6	57.73234 1	11.455706 7	.35E-4 1	6.933219	25	8	.43
36748.0	106.86 8	82.57 5	32.89 1	.1667 4	58.6439 2	11.45586 8	.35E-4 8	6.925067	30	8	3.29
36750.0	117.5 1	75.53 2	32.890 4	.1660 3	59.5555 4	11.4559 2	.32E-4 3	6.931109	24	8	.94
36752.0	128.0 2	68.51 3	32.890 5	.1657 5	60.468 1	11.4559 1	.30E-4 3	6.93343	26	8	1.10
36754.0	138.4 2	61.50 3	32.889 5	.1654 5	61.3804 9	11.4561 1	.25E-4 3	6.936142	28	8	1.10
36756.0	148.93 4	54.48 2	32.887 4	.1652 1	62.2931 2	11.45640 6	.23E-4 2	6.935963	30	8	.76
36758.0	159.52 9	47.50 2	32.880 5	.1657 3	63.2053 4	11.45654 6	.23E-4 2	6.933598	28	8	.59
36760.0	170.1 1	40.47 2	32.884 7	.1658 4	64.1181 5	11.45656 7	.23E-4 2	6.932317	26	8	.65
36762.0	180.6 1	33.45 2	32.89 1	.1657 4	65.0314 4	11.45662 7	.22E-4 2	6.933125	24	8	.63
36764.0	191.3 2	26.43 4	32.89 3	.166 1	65.944 1	11.4569 1	.28E-4 3	6.927955	16	8	.74
36766.0	201.9 4	19.53 6	32.80 5	.168 2	66.856 2	11.4565 3	.●3E-4 4	6.917642	15	8	1.17
36768.0	212.0 3	12.44 5	32.83 6	.164 2	67.773 2	11.4569 1	.25E-4 3	6.94559	11	8	.58
36770.0	222.75 3	5.399 8	32.897 9	.16494 9	68.68621 8	11.45696 5	.23E-4 3	6.939509	10	8	.60
36772.0	233.3 1	358.39 4	32.90 3	.1651 3	69.6004 2	11.4572 1	.2E-4 1	6.938562	10	8	2.16
36774.0	243.8 1	351.37 5	32.90 3	.1650 3	70.5149 3	11.4573 1	.3E-4 1	6.939316	9	8	2.39
36776.0	254.44 6	344.36 3	32.89 2	.1649 2	71.4291 2	11.45722 3	.14E-4 4	6.939927	14	8	1.95
36778.0	265.09 9	337.36 3	32.90 2	.1647 3	72.3434 2	11.4574 1	.4E-5 8	6.941225	16	8	2.63
36780.0	275.58 3	330.33 1	32.884 3	.16495 8	73.25833 7	11.45736 2	.14E-4 3	6.939262	20	8	.94

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36782.0	286.16 3	323.31 1	32.883 3	.16494 7	70.17309 7	11.45741 1	.14E-4 2	6.939334	27	8	1.01
36784.0	296.78 8	316.31 3	32.886 6	.1649. 2	75.0878 2	11.45744 4	.19E-4 3	6.940131	27	8	2.84
36786.0	307.27 3	309.28 1	32.880 3	.16501 7	76.00301 7	11.45755 1	.16E-4 1	6.938752	26	8	1.14
36788.0	317.89 5	302.26 2	32.877 4	.16503 8	76.9181 1	11.45757 2	.14E-4 2	6.938586	33	8	1.77
36790.0	328.45 4	295.23 2	32.877 2	.16509 7	77.83333 9	11.45763 2	.17E-4 2	6.937985	32	8	1.79
36792.0	339.02 3	288.23 1	32.875 2	.16512 4	78.74866 6	11.45771 2	.15E-4 1	6.937774	37	8	1.09
36794.0	349.61 3	281.21 1	32.872 2	.16515 4	79.66408 6	11.45777 2	.18E-4 1	6.937488	38	8	.97
36796.0	.20 4	274.18 2	32.872 3	.16519 5	80.57964 8	11.45782 3	.17E-4 2	6.937126	30	8	1.05
36798.0	10.76 4	267.18 1	32.868 2	.16524 4	81.49533 7	11.45790 2	.20E-4 1	6.936666	23	8	.58
36800.0	21.14 6	260.21 2	32.865 4	.16543 7	82.4115 1	11.45811 7	.16E-4 2	6.934974	14	8	.58
36802.0	30.7 5	253.5 2	32.77 6	.1668 6	83.329 1	11.4576 3	.3E-4 3	6.923882	10	8	7.15
36804.0	41.6 2	246.34 9	32.79 4	.1665 4	84.2446 5	11.4581 2	.44E-4 1	6.925769	13	8	5.72
36806.0	52.6 2	239.20 4	32.819 3	.1661 3	85.1603 3	11.4584 1	.2E-4 1	6.929268	15	8	4.36
36808.0	63.2 1	232.10 3	32.82 3	.1661 2	86.0770 3	11.4584 2	.2E-4 1	6.929109	16	8	4.26
36810.0	73.8 1	225.04 4	32.85 3	.1658 3	86.9939 3	11.45859 9	.3E-4 1	6.931774	18	8	4.35
36812.0	84.41 6	218.05 2	32.87 1	.1658 1	87.9106 1	11.45863 2	.28E-4 2	6.932143	16	8	1.53
36814.0	94.91 2	211.027 9	32.865 2	.16572 3	88.82798 4	11.45872 1	.290E-4 9	6.93232	22	8	.61
36816.0	105.43 3	204.01 1	32.864 3	.16568 4	89.74552 5	11.45882 2	.27E-4 1	6.932629	30	8	.69
36818.0	115.96 4	196.99 1	32.864 4	.16565 5	90.66328 7	11.45893 2	.26E-4 2	6.932846	34	8	.82
36820.0	126.46 3	189.989 8	32.872 2	.16561 3	91.58124 5	11.45810 1	.157E-4 9	6.933125	36	8	.76
36822.0	137.01 5	182.97 1	32.874 4	.16553 3	92.4992 1	11.45908 3	.10E-4 2	6.933799	26	8	1.00
36824.0	147.49 6	175.96 2	32.872 4	.16550 7	93.4175 1	11.45909 3	.13E-4 2	6.934038	22	8	1.26
36826.0	158.02 5	168.94 1	32.875 3	.16541 6	94.3357 1	11.45912 2	.12E-4 1	6.934767	21	8	1.13
36828.0	168.62 5	161.92 2	32.877 4	.16525 5	95.2539 1	11.45910 4	.16E-4 3	6.936117	24	8	1.37
36830.0	179.20 4	154.92 1	32.878 3	.16515 4	96.17217 8	11.45921 3	.17E-4 1	6.936919	30	8	1.24
36832.0	189.79 4	147.89 1	32.882 3	.16503 3	97.09064 8	11.45929 3	.16E-4 1	6.93782	28	8	1.14
36834.0	200.34 6	140.89 2	32.881 5	.16499 2	98.0093 1	11.45937 5	.17E-4 2	6.938122	27	8	1.80
36836.0	210.81 9	133.88 2	32.881 8	.16504 4	98.9283 2	11.45949 9	.16E-4 3	6.93769	27	8	2.47
36838.0	221.35 8	126.86 2	32.882 8	.16498 5	99.8473 2	11.45952 8	.18E-4 2	6.938179	25	8	2.24
36840.0	231.92 6	119.85 2	32.883 7	.16489 5	100.76640 1	11.45963 7	.13E-4 2	6.93884	19	8	1.24

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36842.0	242.47 7	112.83 2	32.890 1	.16485 4	101.6857 1	11.45965 9	.13E-4 2	6.93917	16	8	1.25
36844.0	252.2 3	105.9 1	32.89 9	.16478 4	102.6069 6	11.4604 3	.30E-4 8	6.939453	11	8	4.55
36846.0	262.4 6	98.71 9	33.11 1	.1663 2	103.527 1	11.4601 5	.2E-4 2	6.926948	8	8	8.99
36848.0	272.9 4	91.84 7	33.04 7	.1656 6	104.4469 9	11.4595 3	-.1E-5 6	6.932937	11	8	7.36
36850.0	284.3 3	84.88 8	32.95 4	.1651 2	105.3645 6	11.4596 4	.38E-4 9	6.93713	13	8	4.88
36852.0	295.30 8	77.73 2	32.887 7	.16486 4	106.2835 2	11.45910 5	.9E-5 2	6.939017	19	8	1.29
36854.0	305.90 4	70.72 1	32.889 3	.16485 2	107.20316 8	11.45993 3	.78E-5 9	6.939059	21	8	.75
36856.0	316.47 3	63.705 8	32.887 2	.16490 2	108.12301 7	11.45992 2	.100E-4 6	6.938663	21	8	.57
36858.0	327.07 3	56.686 7	32.891 2	.16492 2	109.04284 6	11.45910 2	.145E-4 7	6.938487	25	8	.62
36860.0	337.66 2	49.672 6	32.893 2	.16497 1	109.96279 5	11.46006 2	.159E-4 7	6.938033	23	8	.64
36862.0	348.24 5	42.66 2	32.892 4	.16507 3	110.8829 1	11.46006 6	.12E-4 2	6.93725	25	8	1.56
36864.0	358.79 5	35.66 2	32.891 5	.16515 4	111.8032 1	11.46012 5	.13E-4 2	6.936491	25	8	1.65
36866.0	9.34 5	28.64 2	32.890 5	.16523 3	112.7236 1	11.46022 5	.17E-4 2	6.935834	20	8	1.40
36868.0	19.93 4	21.63 2	32.881 4	.16531 3	113.6440 1	11.46030 5	.15E-4 2	6.935135	17	8	1.15
36870.0	30.41 5	14.61 2	32.881 4	.16542 4	114.5647 1	11.46037 4	.14E-4 2	6.934182	32	8	1.39
36872.0	40.95 5	7.60 2	32.877 5	.16554 4	115.4855 1	11.46047 5	.15E-5 2	6.93313	23	8	1.30
36874.0	51.53 5	.57 2	32.879 5	.16564 4	116.4062 1	11.46044 3	.10E-4 2	6.932326	25	8	1.26
36876.0	62.04 5	353.56 2	32.878 6	.16563 5	117.3272 1	11.46050 3	.15E-4 1	6.932338	28	8	1.46
36878.0	72.53 6	346.57 2	32.872 9	.16563 6	118.2483 1	11.46052 5	.21E-4 3	6.932355	21	8	1.31
36880.0	83.00 5	339.53 2	32.874 9	.16557 6	119.1696 1	11.46061 3	.5E-5 2	6.932802	22	8	1.48
36882.0	93.65 7	332.51 2	32.87 1	.16564 8	120.0906 2	11.46061 5	.11E-4 4	6.932228	15	8	1.56
36884.0	104.06 3	325.478 6	32.875 7	.16560 4	121.01196 7	11.46066 4	.6E-5 2	6.932556	14	8	.66
36886.0	114.55 5	318.46 1	32.879 8	.16560 6	121.9334 1	11.46076 3	.6E-5 3	6.932484	17	8	1.17
36888.0	125.08 6	311.46 2	32.88 1	.16568 8	122.8546 1	11.46078 8	.12E-4 3	6.931889	19	8	1.37
36890.0	135.55 5	304.45 2	32.883 9	.16557 9	123.7762 1	11.46074 6	.11E-4 3	6.932748	28	8	1.24
36892.0	146.09 4	297.42 2	32.874 8	.16540 9	124.69769 9	11.46064 5	.5E-5 1	6.934229	35	8	1.01
36894.0	156.73 6	290.39 3	32.868 7	.1653 7	125.6190 1	11.46064 4	.4E-5 2	6.93507	41	8	.97
36896.0	167.37 6	283.40 3	32.874 6	.1657 8	126.5404 2	11.46067 5	.5E-5 1	6.931874	44	8	.99
36898.0	177.91 6	276.35 3	32.864 4	.166 1	127.4621 3	11.46083 6	.11E-4 2	6.933013	47	8	1.08
36900.0	188.41 6	269.30 2	32.864 4	.16520 9	128.3840 1	11.46088 3	.9E-5 2	6.935771	58	8	1.28
36902.0	198.89 4	262.30 2	32.864 2	.16498 7	129.30598 8	11.46088 3	.9E-5 2	6.937601	60	8	1.04

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36904.0	209.47 4	255.28 2	32.865 3	.16486 6	130.22781 6	11.46093 2	.129E-4 9	6.938611	73	8	.72
36906.0	220.05 3	248.26 1	32.867 3	.16475 6	131.14977 5	11.46100 1	.137E-4 9	6.939479	75	8	.70
36908.0	230.61 3	241.26 2	32.863 5	.16455 8	132.07184 6	11.46112 3	.9E-5 1	6.941116	61	8	.68
36910.0	241.19 3	234.22 2	32.869 5	.16449 8	132.99408 5	11.46112 3	.10E-4 1	6.941627	53	8	.69
36912.0	251.81 2	227.175 5	32.879 1	.16480 5	133.91639 3	11.461171 6	.89E-5 5	6.939046	37	8	.56
36914.0	262.36 2	220.159 5	32.882 2	.16469 6	134.83880 3	11.461188 6	.88E-5 5	6.939884	26	8	.51
36916.0	272.96 1	213.149 5	32.881 2	.16475 5	135.76117 3	11.461227 7	.88E-5 8	6.939395	21	8	.42
36918.0	283.56 2	206.125 8	32.882 2	.16476 6	136.68364 3	11.461246 8	.85E-5 1	6.939323	21	8	.66
36920.0	294.12 4	199.07 2	32.887 6	.1647 2	137.60627 7	11.46130 3	.10E-4 3	6.939893	18	8	1.91
36922.0	304.68 5	192.07 2	32.883 8	.1647 2	138.52891 9	11.46134 5	.7E-5 3	6.939478	17	8	2.06
36924.0	315.21 7	185.06 2	32.880 8	.1647 3	139.4517 1	11.46139 7	.4E-5 7	6.939632	13	8	1.64
36926.0	325.94 9	178.14 8	32.879 2	.1658 5	140.3741 3	11.46131 9	.1E-5 5	6.931029	8	8	1.32
36928.0	337. 1	171.1 3	33.0 1	.166 2	141.296 2	11.4611 6	.0E-4 3	6.932584	9	8	12.47
36930.0	350. 2	162.3 7	33.1 1	.168 3	142.217 4	11.4591 9	.13E-3 1	6.913551	8	8	15.20
36932.0	357.8 6	157.1 1	32.97 8	.1641 9	143.142 1	11.4605 7	.4E-4 3	6.94518	14	8	13.52
36934.0	8.6 4	150.1 1	32.96 6	.1648 6	144.0648 9	11.4620 2	-.1E-4 2	6.938925	20	8	12.45
36936.0	19.1 3	143.0 1	32.90 4	.1650 5	144.9882 6	11.4622 1	.1E-4 1	6.937148	22	8	9.14
36938.0	29.21 3	135.95 1	32.880 3	.16530 4	145.91225 5	11.46168 2	.13E-4 1	6.934629	23	8	.99
36940.0	39.70 3	128.94 1	32.880 2	.16538 4	146.83564 5	11.46172 2	.10E-4 1	6.933949	21	8	.83
36942.0	50.24 2	121.92 1	32.880 2	.16553 4	147.75900 4	11.46174 2	.10E-4 2	6.932729	20	8	.99
36944.0	60.75 3	114.90 2	32.880 3	.16559 4	148.68252 4	11.46176 2	.7E-5 2	6.932188	17	8	1.00
36946.0	71.4 1	107.72 8	32.88 1	.1655 2	149.6062 2	11.4619 2	.1E-4 1	6.933306	13	8	4.50
36948.0	81.9 1	100.76 6	32.87 1	.1656 2	150.5295 2	11.46175 2	.8E-5 5	6.932509	16	8	4.19
36950.0	92.36 5	93.87 4	32.872 8	.1657 1	151.45313 7	11.46189 3	.4E-5 3	6.93131	13	8	1.62
36952.0	102.88 3	86.87 2	32.870 6	.16564 5	152.37682 5	11.46207 4	.7E-5 1	6.93164	18	8	1.21
36954.0	113.37 4	79.81 3	32.880 8	.16557 8	153.30077 6	11.46192 3	.6E-5 1	6.932302	25	8	1.77
36956.0	123.87 4	72.77 2	32.890 1	.1655 1	154.22466 7	11.46189 3	.10E-4 3	6.932701	25	8	1.90
36958.0	134.39 4	65.76 2	32.89 1	.1654 1	155.14859 9	11.46195 3	.9E-5 2	6.933888	29	8	2.47
36960.0	144.93 4	58.72 2	32.90 1	.1652 2	156.07257 9	11.46202 2	.10E-4 2	6.935005	34	8	2.61
36962.0	155.46 4	51.72 2	32.90 1	.1653 2	156.99660 8	11.46205 3	.10E-4 4	6.93[illegible]451	38	8	2.50
36964.0	166.01 2	44.701 8	32.90 7	.16517 9	157.92072 5	11.46206 3	.9E-5 2	6.935568	40	8	1.20

T (MJD)	ω	Ω	i	e	M	n	n'	a	N	D	σ
36966.0	176.55 2	37.702 8	32.904 6	.16515 7	158.84493 7	11.46216 4	.15E-4 2	6.935705	43	8	.80
36968.0	187.0 1	30.70 2	32.904 7	.1655 4	159.7697 4	11.46229 6	.18E-4 1	6.933196	39	8	.60
36970.0	197.6 1	23.67 2	32.897 6	.1651 3	160.6939 4	11.46227 6	.16E-4 2	6.936234	33	8	.51
36972.0	208.6 1	16.64 2	32.894 5	.1649 4	161.6182 5	11.46230 6	.11E-4 1	6.938169	28	8	.51
36974.0	218.8 1	9.46 5	32.88 1	.1664 4	162.5438 5	11.4621 2	.5E-5 5	6.925355	28	8	1.89
36976.0	229.47 9	2.45 7	32.89 1	.1654 5	163.4680 2	11.46236 9	.15E-4 7	6.933721	43	8	3.45
36978.0	240.02 4	355.46 3	32.884 6	.1652 2	164.39277 5	11.46246 3	.5E-5 4	6.935424	52	8	1.87
36980.0	250.54 4	348.47 3	32.885 5	.1650 2	165.31767 4	11.46245 2	.8E-5 2	6.936714	70	8	1.93
36982.0	261.04 1	341.53 1	32.885 2	.16460 9	166.24258 2	11.46246 7	.80E-5 1	6.940131	81	8	.97
36984.0	271.62 1	334.523 8	32.884 2	.16457 8	167.16755 2	11.46248 9	.7E-5 1	6.940425	90	8	.92
36986.0	282.220 8	327.504 7	32.883 2	.16452 8	168.09255 2	11.462522 9	.7E-5 1	6.940785	92	8	.89
36988.0	292.803 6	320.488 5	32.883 1	.16457 6	169.01763 2	11.462566 5	.84E-5 7	6.940385	78	8	.64
36990.0	303.37 1	313.471 8	32.881 2	.1648 1	169.94284 4	11.46260 9	.68E-5 1	6.93868	72	8	1.15
36992.0	313.95 1	306.45 1	32.876 3	.1649 1	170.86807 4	11.46260 1	.11E-4 2	6.937732	62	8	1.38
36994.0	324.54 2	299.42 1	32.876 3	.16481 9	171.79335 4	11.46267 1	.10E-4 1	6.938315	55	8	1.42
36996.0	335.18 2	292.44 1	32.873 4	.16492 9	172.71874 4	11.46272 1	.10E-4 1	6.937401	54	8	1.45
36998.0	345.68 2	285.38 1	32.872 4	.16496 8	173.64423 4	11.46278 1	.11E-4 1	6.937005	46	8	1.35
37000.0	356.23 2	278.36 1	32.868 4	.16505 9	174.56982 4	11.46280 1	.11E-4 1	6.936239	39	8	1.26
37002.0	6.79 2	271.35 1	32.863 5	.1652 1	175.49544 5	11.46285 2	.14E-4 3	6.935384	28	8	1.26
37004.0	17.35 1	264.325 5	32.856 3	.16511 7	176.42114 3	11.462857 1	.92E-5 1	6.935781	21	8	.62
37006.0	27.93 1	257.288 7	32.851 3	.16509 8	177.34687 3	11.46288 1	.7E-5 2	6.935928	21	8	.53
37008.0	38.43 2	250.27 2	32.857 5	.1655 1	178.27296 7	11.46310 3	.18E-4 3	6.93279	23	8	.69
37010.0	48.86 4	243.27 2	32.861 4	.1658 1	179.1993 1	11.46314 4	.15E-4 2	6.929975	27	8	.72
37012.0	59.36 3	236.17 3	32.845 8	.1656 2	180.12570 8	11.46317 3	.4E-5 4	6.931696	29	8	1.59
37014.0	69.88 5	229.16 5	32.84 1	.1653 3	181.0517 1	11.46305 6	.11E-4 6	6.933912	25	8	2.07
37016.0	80.64 4	222.15 3	32.85 1	.1657 3	181.9772 1	11.46305 5	.12E-4 8	6.931039	26	8	2.58
37018.0	91.13 2	215.13 1	32.855 6	.1654 1	182.90355 5	11.46319 2	.10E-4 2	6.932851	27	8	1.30
37020.0	101.66 2	208.11 2	32.865 5	.1655 1	183.82992 6	11.46327 2	.15E-4 4	6.932396	30	8	1.45
37022.0	112.16 2	201.09 1	32.866 4	.16548 8	184.75647 5	11.46332 2	.19E-4 2	6.932523	40	8	1.32
37024.0	122.66 1	194.052 7	32.864 2	.16541 5	185.68321 4	11.46339 1	.30E-4 1	6.933027	41	8	.84

TABLE 2

DATA RELATED TO SOLAR EFFECTS ON ACCELERATION OF 1959 $\alpha 1$

PERIGEE IN SUNLIGHT

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36618.	0.917E-06	562.	19.38	352.94	31.77	2.4
36620.	0.718E-06	561.	14.31	353.87	25.94	1.3
36622.	0.687E-06	560.	8.92	354.16	19.97	0.5
36624.	0.794E-06	560.	3.32	354.20	14.02	0.1
36626.	0.866E-06	560.	-2.37	354.13	8.61	0.0
36628.	0.828E-06	561.	-8.01	354.14	5.80	0.4
36630.	0.771E-06	562.	-13.47	354.41	8.34	1.2
36632.	0.747E-06	564.	-18.59	355.17	13.05	2.2
36634.	0.742E-06	566.	-23.20	356.49	17.87	3.3
36636.	0.761E-06	568.	-27.12	358.52	22.30	4.5
36638.	0.832E-06	569.	-30.15	1.21	26.09	5.4
36640.	0.870E-06	570.	-32.12	4.52	29.13	6.1
36642.	0.896E-06	570.	-32.89	8.14	31.32	6.3
36644.	0.977E-06	570.	-32.43	11.78	32.64	6.2
36646.	0.977E-06	569.	-30.74	15.19	33.10	5.6
36648.	0.107E-05	568.	-27.96	18.07	32.77	4.7
36650.	0.104E-05	566.	-24.23	20.26	31.71	3.6
36652.	0.128E-05	565.	-19.79	21.75	30.10	2.5
36654.	0.127E-05	563.	-14.76	22.69	28.16	1.4
36656.	0.992E-06	562.	-9.36	23.14	26.17	0.6
36658.	0.102E-05	561.	-3.76	23.27	24.45	0.1
36660.	0.102E-05	560.	1.95	23.31	23.41	0.0
36662.	0.962E-06	559.	7.61	23.39	23.35	0.4
36664.	0.931E-06	560.	13.06	23.66	24.33	1.1
36666.	0.107E-05	560.	18.19	24.37	26.31	2.1
36668.	0.931E-06	557.	22.76	25.84	29.10	3.2
36670.	0.946E-06	558.	26.67	27.62	31.96	4.4
36672.	0.128E-05	558.	29.81	30.45	35.22	5.3
36674.	0.870E-06	557.	31.95	33.52	38.09	6.0
36676.	0.104E-05	561.	32.83	36.74	40.46	6.3
36678.	0.961E-06	561.	32.49	40.36	42.72	6.2
36680.	0.105E-05	562.	30.95	43.68	44.54	5.7
36682.	0.116E-05	562.	28.30	46.48	45.99	4.8
36684.	0.111E-05	561.	24.71	48.64	47.17	3.7
36686.	0.115E-05	560.	20.34	50.16	48.21	2.6
36688.	0.107E-05	560.	15.41	51.01	49.18	1.5
36690.	0.930E-06	558.	10.05	51.42	50.33	0.6
36692.	0.930E-06	558.	4.46	51.49	51.78	0.1
36694.	0.900E-06	559.	-1.25	51.42	53.67	0.0
36696.	0.854E-06	559.	-6.92	51.39	56.08	0.3
36698.	0.915E-06	561.	-12.45	51.58	59.02	1.0
36700.	0.913E-06	563.	-18.58	53.99	64.38	2.0

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36702.	0.915E-06	564.	-22.35	53.21	66.07	3.1
36704.	0.808E-06	566.	-26.42	54.95	69.96	4.3
36706.	0.701E-06	567.	-29.63	57.36	73.82	5.3
36708.	0.625E-06	568.	-31.81	60.40	77.49	6.0
36710.	0.611E-06	568.	-32.82	63.81	80.73	6.3
36712.	0.602E-06	568.	-32.58	67.33	83.42	6.2
36714.	0.534E-06	567.	-31.12	70.60	85.37	5.7
36716.	0.412E-06	566.	-28.53	73.37	86.52	4.9
36718.	0.305E-06	565.	-24.97	75.51	86.83	3.8
36720.	0.335E-06	565.	-20.62	76.93	86.29	2.7
6722	0.381E-06	564.	-15.70	77.70	84.97	1.6
36724.	0.457E-06	561.	-10.38	77.96	83.06	0.7
36726.	0.471E-06	560.	-4.77	77.94	80.78	0.2
36728.	0.569E-06	559.	0.93	77.72	78.33	0.0
36730.	0.575E-06	558.	6.62	77.55	75.98	0.3
36732.	0.594E-06	557.	12.15	77.56	73.96	0.9
36734.	0.622E-06	557.	17.36	77.94	72.48	1.9
36736.	0.634E-06	557.	22.10	78.84	71.72	3.0
36738.	0.637E-06	558.	26.19	80.37	71.75	4.2
36740.	0.655E-06	559.	29.45	82.59	72.63	5.2
36742.	0.622E-06	560.	31.70	85.44	74.27	5.9
36744.	0.579E-06	561.	32.79	88.72	76.56	6.3
36746.	0.533E-06	561.	32.65	92.13	79.33	6.3
36748.	0.533E-06	552.	31.31	95.30	82.36	5.8
36750.	0.488E-06	558.	28.79	98.14	85.67	5.0
36752.	0.457E-06	559.	25.34	100.20	88.84	3.9
36754.	0.381E-06	561.	21.13	101.48	91.77	2.8
36756.	0.350E-06	559.	16.27	102.27	94.60	1.7
36758.	0.350E-06	556.	10.95	102.66	97.25	0.8
36760.	0.350E-06	554.	5.36	102.66	99.60	0.2
36762.	0.335E-06	555.	-0.33	102.45	101.65	0.0
36764.	0.427E-06	550.	-6.11	102.42	103.77	0.2
36766.	0.655E-06	540.	-11.66	102.64	105.85	0.9
36768.	0.381E-06	569.	-16.70	102.57	107.32	1.8
36770.	0.350E-06	564.	-21.63	103.64	109.58	2.9
36772.	0.305E-06	564.	-25.82	105.22	111.87	4.1
PERIGEE IN EARTH SHADOW						
36774.	0.457E-06	566.	-29.17	107.44	114.31	5.1
36776.	0.213E-06	567.	-31.54	110.48	117.08	5.9
36778.	0.609E-07	569.	-32.76	114.01	119.98	6.3
36780.	0.213E-06	567.	-32.71	117.51	122.69	6.3
36782.	0.213E-06	567.	-31.43	120.94	125.34	5.8
36784.	0.289E-06	567.	-28.99	123.97	127.73	5.1
36786.	0.244E-06	564.	-25.60	126.19	129.45	4.0
36788.	0.213E-06	563.	-21.35	127.87	130.64	2.9
36790.	0.259E-06	561.	-16.50	128.86	131.02	1.7
36792.	0.229E-06	560.	-11.21	129.39	130.67	0.8
36794.	0.274E-06	559.	-5.62	129.58	129.66	0.2
36796.	0.259E-06	559.	0.11	129.59	128.16	0.0
36798.	0.305E-06	558.	5.82	129.63	126.42	0.2
36800.	0.244E-06	557.	11.29	129.72	124.60	0.8

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36802.	0.457E-06	547.	16.04	129.69	122.83	1.7
36804.	0.670E-06	550.	21.07	130.89	121.83	2.9
36806.	0.305E-06	555.	25.50	132.89	121.54	4.0
36808.	0.305E-06	556.	28.93	135.24	121.83	5.1
36810.	0.457E-06	559.	31.39	138.29	122.96	5.8
36812.	0.427E-06	560.	32.69	141.91	125.01	6.3
36814.	0.442E-06	560.	32.73	145.56	127.79	6.3
36816.	0.411E-06	560.	31.54	149.08	131.31	5.9
36818.	0.396E-06	560.	29.20	152.17	135.43	5.1
36820.	0.239E-06	559.	25.88	154.61	139.95	4.1
36822.	0.152E-06	558.	21.72	156.39	144.71	2.9
36824.	0.198E-06	557.	16.96	157.48	149.32	1.8
36826.	0.183E-06	557.	11.72	158.10	153.49	0.9
36828.	0.244E-06	558.	6.15	158.42	156.73	0.2
36830.	0.259E-06	559.	0.43	158.55	158.43	0.0
36832.	0.244E-06	560.	-5.30	158.64	158.27	0.2
36834.	0.259E-06	560.	-10.88	158.89	156.51	0.8
36836.	0.244E-06	561.	-16.14	159.40	153.74	1.7
36838.	0.274E-06	563.	-21.02	160.44	150.64	2.8
36840.	0.198E-06	564.	-25.30	162.15	147.66	3.9
36842.	0.198E-06	566.	-28.79	164.51	145.08	5.0
36844.	0.457E-06	567.	-31.13	166.67	143.03	5.8
36846.	0.305E-06	555.	-32.78	169.54	141.56	6.3
36848.	-0.152E-07	561.	-32.99	173.36	141.36	6.3
36850.	0.579E-06	565.	-31.81	178.01	142.25	5.9
36852.	0.137E-06	566.	-29.40	181.50	143.92	5.2
36854.	0.119E-06	565.	-26.10	184.04	146.27	4.2
36856.	0.152E-06	563.	-21.96	185.83	149.35	3.0
36858.	0.221E-06	562.	-17.17	186.99	153.03	1.9
36860.	0.242E-06	561.	-11.91	187.61	157.17	0.9
36862.	0.183E-06	559.	-6.35	187.84	161.56	0.3
36864.	0.198E-06	558.	-0.66	187.84	165.92	0.0
36866.	0.259E-06	558.	5.06	187.80	169.78	0.2
36868.	0.228E-06	557.	10.66	187.95	172.01	0.7
36870.	0.213E-06	557.	15.95	188.31	171.48	1.6
36872.	0.228E-07	557.	20.84	189.20	168.74	2.7
36874.	0.152E-06	558.	25.15	190.72	165.30	3.9
36876.	0.228E-06	559.	28.65	192.87	161.95	4.9
36878.	0.320E-06	560.	31.18	195.65	158.93	5.8
36880.	0.761E-07	561.	32.60	198.84	156.41	6.2
36882.	0.167E-06	560.	32.79	202.48	154.23	6.3
36884.	0.914E-07	560.	31.77	205.69	152.71	6.0
36886.	0.914E-07	559.	29.59	208.57	151.50	5.2
36888.	0.183E-06	558.	26.38	210.88	150.47	4.2
36890.	0.167E-06	557.	22.35	212.42	149.54	3.1
36892.	0.761E-07	558.	17.63	213.35	148.38	2.0
36894.	0.609E-07	558.	12.38	213.82	146.72	1.0
36896.	0.761E-07	554.	6.82	213.93	144.46	0.3
36898.	0.167E-06	555.	1.13	213.66	141.73	0.0
36900.	0.137E-06	558.	-4.55	213.32	138.45	0.1
36902.	0.137E-06	560.	-10.12	213.13	134.65	0.7
36904.	0.196E-06	562.	-15.48	213.32	130.43	1.5

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36906.	0.209E-06	564.	-20.44	213.96	126.06	2.6
36908.	0.137E-06	567.	-24.79	215.22	121.75	3.8
36910.	0.152E-06	568.	-28.39	217.13	117.68	4.9
36912.	0.136E-06	566.	-31.05	219.74	114.02	5.7

PERIGEE IN SUNLIGHT

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36914.	0.134E-06	568.	-32.55	222.82	111.03	6.2
36916.	0.134E-06	567.	-32.83	226.20	108.75	6.3
36918.	0.129E-06	567.	-31.86	229.47	107.37	6.0
36920.	0.152E-06	567.	-29.71	232.24	106.96	5.3
36922.	0.107E-06	565.	-26.52	234.44	107.46	4.3
36924.	0.609E-07	564.	-22.49	235.91	108.84	3.2
36926.	0.152E-07	555.	-17.70	237.00	110.80	2.0

PERIGEE IN EARTH SHADOW

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36928.	-0.609E-01	555.	-12.29	237.73	113.22	1.0
36930.	0.198E-05	535.	-5.44	237.91	116.62	0.3
36932.	0.609E-06	567.	-1.20	237.05	119.44	0.0
36934.	-0.152E-06	561.	4.67	236.91	122.17	0.1
36936.	0.152E-06	559.	10.24	236.58	124.64	0.6
36938.	0.198E-06	558.	15.36	236.27	126.60	1.5
36940.	0.152E-06	558.	20.29	236.80	127.39	2.6
36942.	0.152E-06	558.	24.67	237.97	127.17	3.7
36944.	0.107E-06	559.	28.27	239.81	126.02	4.8
36946.	0.152E-06	561.	30.97	242.32	124.07	5.7
36948.	0.122E-06	560.	32.50	245.42	121.49	6.2
36950.	0.609E-07	559.	32.84	248.81	118.54	6.3
36952.	0.107E-06	559.	31.94	252.09	115.49	6.0

PERIGEE IN SUNLIGHT

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36954.	0.913E-07	559.	29.89	254.90	112.57	5.3
36956.	0.152E-06	559.	26.80	257.16	109.81	4.4
36958.	0.137E-06	559.	22.83	258.79	107.28	3.2
36960.	0.152E-06	559.	18.19	259.77	105.08	2.1
36962.	0.152E-06	557.	13.04	260.24	103.15	1.1
36964.	0.137E-06	558.	7.55	260.32	101.47	0.4
36966.	0.228E-06	557.	1.87	260.19	99.93	0.0
36968.	0.274E-06	555.	-3.80	259.94	98.52	0.1
36970.	0.244E-06	558.	-9.45	259.92	96.94	0.6
36972.	0.167E-06	561.	-15.07	260.56	94.80	1.4
36974.	0.761E-07	549.	-19.89	260.82	93.36	2.5
36976.	0.228E-06	559.	-24.38	262.29	91.04	3.7
36978.	0.761E-07	562.	-28.05	264.36	88.58	4.8
36980.	0.122E-06	564.	-30.79	267.08	85.97	5.6
36982.	0.122E-06	568.	-32.43	270.39	83.25	6.2
36984.	0.107E-06	568.	-32.87	274.01	80.54	6.3
36986.	0.107E-06	568.	-32.05	277.61	77.99	6.1
36988.	0.128E-06	567.	-30.03	280.82	75.75	5.4
36990.	0.104E-06	565.	-26.96	283.41	73.96	4.4
36992.	0.167E-06	563.	-23.00	285.34	72.66	3.3
36994.	0.152E-06	562.	-18.36	286.60	71.90	2.1
36996.	0.152E-06	560.	-13.17	287.41	71.54	1.1

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36998.	0.167E-06	559.	-7.72	287.61	71.79	0.4
37000.	0.167E-06	558.	-2.04	287.67	72.22	0.0
37002.	0.213E-06	557.	3.68	287.69	72.71	0.1
37004.	0.140E-06	558.	9.31	287.82	73.10	0.6
37006.	0.107E-06	559.	14.72	288.25	73.20	1.4
37008.	0.274E-06	557.	19.71	289.07	72.88	2.4
37010.	0.228E-06	555.	24.12	290.44	72.04	3.6
37012.	0.609E-07	558.	27.82	292.45	70.58	4.7
37014.	0.167E-06	561.	30.61	295.24	68.38	5.6
37016.	0.183E-06	559.	32.36	298.87	65.38	6.2
37018.	0.152E-06	561.	32.85	302.48	62.14	6.3
37020.	0.228E-06	560.	32.10	306.09	58.54	6.1
37022.	0.289E-06	560.	30.17	309.32	54.84	5.4
37024.	0.457E-06	559.	27.18	311.94	51.28	4.5

TABLE 3

MEAN ORBITAL ELEMENTS OF SATELLITE 1959 $\alpha 2$

T (MJD)	ω	Ω	i	e	M	n	n'	a	N	D	σ
36640.0	251.23 4	105.91 1	32.946 5	.18379 4	.2120 2	11.06930 8	.55E-4 3	6.94037	42	8	.97
36642.0	260.97 2	99.353 5	32.945 3	.18370 2	.35104 7	11.06927 6	.58E-4 5	6.941213	73	8	.84
36644.0	270.93 2	92.802 4	32.944 2	.18367 2	.48985 5	11.06957 3	.58E-4 2	6.941305	105	8	.70
36646.0	280.83 2	86.251 3	32.943 2	.18367 2	.62931 5	11.06986 2	.60E-4 1	6.941217	123	8	.72
36648.0	290.73 1	79.698 3	32.945 2	.18366 2	.76923 5	11.07015 2	.629E-4 9	6.941111	107	8	.61
36650.0	300.61 1	73.144 4	32.944 2	.18368 2	.90974 5	11.07038 2	.664E-4 9	6.940896	72	8	.53
36652.0	310.45 2	66.595 7	32.948 2	.18366 3	1.05092 6	11.07065 2	.77E-4 1	6.940948	65	8	.76
36654.0	320.34 2	60.034 6	32.944 2	.18372 2	1.19253 4	11.07012 2	.824E-4 7	6.94030	55	8	.50
36656.0	330.20 1	53.476 6	32.942 2	.18372 2	1.33490 4	11.07132 2	.75E-4 1	6.940146	51	8	.51
36658.0	340.05 1	46.923 6	32.939 1	.18377 2	1.47791 4	11.07160 1	.649E-4 7	6.939606	62	8	.57

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36660.0	349.93 1	40.367 6	32.935 1	.18385 2	1.62132 4	11.07188 2	.585E-4 8	6.938783	59	8	.58
36662.0	359.78 2	33.807 6	32.932 2	.18391 2	1.76526 5	11.07209 2	.57E-4 1	6.938232	66	8	.69
36664.0	9.67 2	27.247 7	32.929 2	.18401 3	1.90955 7	11.07227 2	.55E-4 1	6.937316	68	8	.91
36666.0	19.56 2	20.683 8	32.927 3	.18407 4	2.05427 8	11.07248 2	.59E-4 2	6.936677	62	8	1.00
36668.0	29.38 3	14.125 9	32.923 3	.18419 5	2.19967 9	11.07289 2	.71E-4 2	6.93551	56	8	1.11
36670.0	39.21 3	7.568 9	32.921 3	.18430 5	2.34562 8	11.07314 2	.63E-4 2	6.93445	51	8	1.04
36672.0	49.00 2	1.000 8	32.917 3	.18428 4	2.49222 6	11.07334 1	.64E-4 2	6.934502	53	8	.88
36674.0	58.81 2	354.437 8	32.914 3	.18428 5	2.63924 6	11.07359 1	.68E-4 1	6.93441	49	8	.83
36676.0	68.65 2	347.876 7	32.911 3	.18429 5	2.78668 5	11.07387 1	.67E-4 1	6.934207	50	8	.77
36678.0	78.48 1	341.308 5	32.910 3	.18429 4	2.93470 4	11.074129 9	.653E-4 8	6.934127	46	8	.65
36680.0	88.33 1	334.750 5	32.909 3	.18436 4	3.08316 4	11.074381 8	.65E-4 1	6.933464	43	8	.58
36682.0	98.19 1	328.185 4	32.905 2	.18437 4	3.23214 3	11.074655 8	.666E-4 9	6.933193	43	8	.52
36684.0	108.04 1	321.617 4	32.904 3	.18438 4	3.38168 4	11.07493 1	.72E-4 1	6.93301	37	8	.55
36686.0	117.88 1	315.046 4	32.904 2	.18431 4	3.53185 4	11.075224 7	.74E-4 1	6.933497	33	8	.43
36688.0	127.72 2	308.480 5	32.898 3	.18425 6	3.68264 6	11.075523 9	.70E-4 1	6.933864	35	8	.62
36690.0	137.55 2	301.911 6	32.901 4	.18410 8	3.83404 7	11.07580 2	.64E-4 1	6.935085	29	8	.68
36692.0	147.41 2	295.340 6	32.903 3	.18404 6	3.98488 5	11.07603 1	.56E-4 1	6.935464	34	8	.67
36694.0	157.26 1	288.769 6	32.906 3	.18394 5	4.13818 4	11.076252 9	.560E-4 9	6.936219	35	8	.66
36696.0	167.16 3	282.19 2	32.906 7	.1839 1	4.29084 7	11.07652 2	.56E-4 2	6.93632	41	8	1.63
36698.0	177.02 2	275.63 1	32.911 5	.18381 7	4.44402 5	11.07669 2	.58E-4 1	6.937159	44	8	1.29
36700.0	186.91 2	269.058 9	32.910 4	.18376 6	4.59766 4	11.07694 2	.59E-4 2	6.937453	45	8	.93
36702.0	196.73 4	262.47 3	32.909 9	.1838 2	4.7520 1	11.07727 3	.70E-4 4	6.937264	56	8	.72
36704.0	206.57 3	255.90 2	32.914 7	.1834 2	4.90691 8	11.07757 2	.63E-4 3	6.940451	56	8	2.12
36706.0	216.37 3	249.34 2	32.918 7	.1831 2	5.06239 8	11.07781 3	.63E-4 5	6.942729	50	8	1.79
36708.0	226.26 4	242.75 2	32.923 7	.1825 3	5.2180 1	11.07781 3	.48E-4 3	6.947984	49	8	2.95
36710.0	236.21 2	236.21 1	32.916 4	.1829 2	5.37369 7	11.07803 1	.49E-4 1	6.944346	46	8	1.63
36712.0	246.15 1	229.66 1	32.917 3	.1835 2	5.52978 5	11.07829 2	.37E-4 1	6.939286	38	8	1.26
36714.0	256.02 1	223.09 1	32.920 3	.1835 1	5.68647 3	11.07841 1	.33E-4 1	6.938876	44	8	1.21
36716.0	265.91 1	216.518 8	32.921 3	.18340 8	5.84342 2	11.07850 1	.269E-4 8	6.939857	44	8	1.11
36718.0	275.812 9	209.945 5	32.920 2	.18345 6	6.00055 1	11.078611 6	.220E-4 6	6.939371	49	8	.82

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36720.0	285.71 1	203.374 5	32.922 3	.18345 6	6.15786 2	11.078700 6	.225E-4 6	6.939327	50	8	.94
36722.0	295.62 1	196.802 5	32.922 3	.18337 7	6.31532 2	11.07878 1	.21E-4 1	6.940038	45	8	1.05
36724.0	305.52 1	190.230 5	32.923 2	.18337 7	6.47299 2	11.078892 9	.294E-4 9	6.939969	51	8	.90
36726.0	315.41 1	183.660 5	32.925 2	.18338 7	6.63093 2	11.079012 9	.27E-4 1	6.939832	50	8	.81
36728.0	325.279 9	177.090 5	32.923 2	.18363 6	6.78904 2	11.07915 1	.303E-4 8	6.93764	57	8	.70
36730.0	335.158 8	170.522 4	32.923 2	.18371 5	6.94742 2	11.079240 9	.335E-4 8	6.936929	69	8	.72
36732.0	345.038 9	163.960 5	32.924 2	.18378 5	7.10604 3	11.07937 1	.370E-4 7	6.936263	77	8	.81
36734.0	354.915 9	157.383 5	32.923 2	.18383 4	7.26501 3	11.079562 9	.408E-4 9	6.935765	79	8	.83
36736.0	4.794 9	150.815 5	32.922 2	.18388 4	7.42428 3	11.079740 9	.397E-4 7	6.935254	66	8	.69
36738.0	14.673 9	144.236 5	32.923 2	.18391 4	7.58388 3	11.079865 8	.395E-4 8	6.934981	62	8	.64
36740.0	24.556 8	137.662 5	32.923 1	.18406 4	7.74373 2	11.080035 6	.440E-4 6	6.933582	56	8	.60
36742.0	34.43 1	131.096 7	32.924 2	.18418 6	7.90396 4	11.08023 1	.39E-4 1	6.932517	55	8	.93
36744.0	44.28 1	124.517 6	32.923 2	.18420 6	8.06460 3	11.080402 9	.40E-4 1	6.932275	56	8	.85
36746.0	54.12 1	117.943 7	32.923 2	.18420 6	8.22557 3	11.08055 1	.43E-4 1	6.932174	45	8	.85
36748.0	64.03 3	111.33 2	32.927 7	.1839 2	8.38682 7	11.08068 4	.40E-4 5	6.934932	44	8	2.32
36750.0	73.81 3	104.79 2	32.934 7	.1836 2	8.5486 8	11.08094 2	.47E-4 4	6.937578	36	8	2.42
36752.0	83.57 3	98.26 2	32.939 8	.1835 3	8.71069 9	11.08111 5	.37E-4 6	6.937829	28	8	1.92
36754.0	93.2 1	91.68 3	32.932 5	.1834 2	8.8737 5	11.0816 3	.37E-4 4	6.938961	32	8	1.52
36756.0	103.36 9	85.11 2	32.929 2	.1844 1	9.0349 4	11.0812 1	.26E-4 2	6.930256	31	8	.69
36758.0	113.157 9	78.551 7	32.931 3	.18440 9	9.19763 2	11.08136 1	.25E-4 2	6.930157	30	8	.77
36760.0	122.99 1	72.01 1	32.931 3	.18433 9	9.36045 3	11.08147 2	.32E-4 2	6.930691	30	8	.79
36762.0	132.85 4	65.41 1	32.935 4	.1842 1	9.5237 1	11.08161 4	.26E-4 2	6.931517	28	8	.74
36764.0	142.9 3	58.86 5	32.93 1	.1851 7	9.686 1	11.0818 2	.36E-4 4	6.924189	22	8	1.01
36766.0	152.8 2	52.28 3	32.93 1	.1851 6	9.849 1	11.0818 2	.38E-4 3	6.924007	24	8	.96
36768.0	162.5 2	45.70 3	32.93 1	.1846 6	10.0140 9	11.0821 1	.34E-4 3	6.927842	25	8	.93
36770.0	172.2 2	39.14 2	32.92 1	.1839 7	10.1792 9	11.0823 1	.27E-4 2	6.933912	17	8	.60
36772.0	182.3 3	32.58 4	32.91 3	.185 1	10.343 1	11.0824 1	.27E-4 3	6.927683	16	8	.64
36774.0	191.7 3	26.07 4	32.84 3	.183 1	10.509 1	11.0823 1	.26E-4 4	6.941665	15	8	.83
36776.0	202.02 4	19.42 1	32.937 9	.1835 1	10.6724 2	11.08265 6	.16E-4 4	6.937066	18	8	.83
36778.0	211.72 4	12.83 2	32.96 2	.1836 2	10.83808 8	11.08246 5	.20E-4 5	6.936901	29	8	2.24
36780.0	221.60 4	6.28 2	32.94 1	.1837 1	11.00320 6	11.08262 2	.23E-4 3	6.935566	35	8	2.25

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36782.0	231.49 4	359.72 3	32.94 1	.1836 1	11.16850 6	11.08272 2	.26E-4 3	6.936191	38	8	2.39
36784.0	241.39 5	353.17 3	32.94 1	.1835 2	11.33399 8	11.08283 2	.21E-4 2	6.937476	34	8	2.53
36786.0	251.31 5	346.57 3	32.936 8	.1835 2	11.49969 8	11.08287 2	.22E-4 3	6.937577	29	8	2.38
36788.0	261.4 2	340.04 6	32.96 2	.1821 7	11.6050 3	11.08287 9	-.1E-4 1	6.948929	28	8	5.10
36790.0	271.1 I	333.49 6	32.96 2	.1828 4	11.8314 3	11.08300 5	.17E-4 5	6.943396	30	8	4.94
36792.0	281.06 1	326.817 9	32.928 3	.18318 6	11.99764 4	11.083108 8	.17E-4 1	6.939783	28	8	.68
36794.0	290.94 1	320.234 7	32.920 2	.18329 4	12.16398 3	11.083150 9	.17E-4 1	6.938887	33	8	.70
36796.0	300.85 2	313.669 8	32.918 2	.18330 5	12.33034 3	11.08323 1	.20E-4 2	6.938746	30	8	.75
36798.0	310.71 2	307.098 9	32.916 2	.18340 6	12.49696 4	11.083326 9	.198E-4 9	6.93785	26	8	.70
36800.0	320.57 5	300.54 2	32.915 3	.1835 1	12.66374 9	11.08340 1	.18E-4 2	6.937173	19	8	.74
36802.0	330.40 2	293.978 9	32.912 3	.18358 6	12.83072 4	11.083456 9	.26E-4 1	6.936293	17	8	.79
36804.0	340.32 2	287.391 7	32.908 3	.18360 4	12.99772 3	11.083551 9	.20E-4 1	6.936024	22	8	.68
36806.0	350.24 2	280.796 7	32.910 3	.18362 4	13.16490 3	11.08359 2	.26E-4 1	6.935861	21	8	.64
36808.0	.17 2	274.212 7	32.908 3	.18368 4	13.33222 3	11.08371 2	.26E-4 1	6.935275	24	8	.60
36810.0	10.06 2	267.633 9	32.905 3	.18378 6	13.49983 6	11.08386 2	.31E-4 2	6.934414	23	8	.58
36812.0	19.94 2	261.04 2	32.906 7	.1843 3	13.6676 1	11.08403 3	.37E-4 2	6.930136	21	8	.53
36814.0	29.79 2	254.47 1	32.897 9	.1844 3	13.8358 1	11.08421 3	.37E-4 2	6.929136	31	8	.70
36816.0	39.65 3	247.98 1	32.90 1	.1845 3	14.0043 1	11.08433 4	.34E-4 2	6.928175	35	8	.78
36818.0	49.50 3	241.31 1	32.89 1	.1845 2	14.1731 1	11.08444 3	.29E-4 2	6.927872	36	8	.79
36820.0	59.37 3	234.718 6	32.895 7	.18416 7	14.34226 6	11.084524 9	.24E-4 1	6.930919	38	8	.79
36822.0	69.23 1	228.135 5	32.895 3	.18422 3	14.51143 2	11.08462 1	.206E-4 8	6.930352	26	8	.48
36824.0											
36826.0	89.1 1	214.90 6	32.89 2	.1841 2	14.8500 2	11.08477 6	.17E-4 3	6.930975	21	8	4.12
36828.0	98.82 4	208.44 2	32.904 4	.18412 7	15.01975 7	11.08489 2	.21E-4 1	6.931057	22	8	1.38
36830.0	108.63 3	201.87 2	32.908 3	.18411 7	15.18963 6	11.08499 2	.17E-4 1	6.931119	33	8	1.40
36832.0	118.46 4	195.28 2	32.910 3	.18409 7	15.35962 7	11.08505 2	.20E-4 1	6.931269	43	8	1.48
36834.0	128.32 4	188.70 2	32.910 3	.18400 7	15.52974 7	11.08510 2	.23E-4 1	6.932006	46	8	1.45
36836.0	138.13 5	182.12 2	32.913 3	.18405 7	15.70012 9	11.08518 2	.22E-4 1	6.931565	40	8	1.38
36838.0	148.06 4	175.53 2	32.912 4	.18391 6	15.87047 9	11.08524 2	.19E-4 1	6.93275	29	8	1.32
36840.0	157.96 4	168.95 2	32.914 4	.18382 6	16.04101 9	11.08532 2	.20E-4 2	6.93341	17	8	1.16

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36842.0	167.86 3	162.36 2	32.923 3	.18377 4	16.21175 6	11.08537 3	.19E-4 3	6.933875	13	8	.70
36844.0	177.74 3	155.791 8	32.923 3	.18367 4	16.38263 7	11.08549 2	.21E-4 2	6.93468	13	8	.66
36846.0	187.64 3	149.218 8	32.922 3	.18359 3	16.55367 7	11.08555 1	.123E-4 7	6.935293	13	8	.54
36848.0	197.52 4	142.647 8	32.923 3	.18352 3	16.72482 9	11.08560 2	.112E-4 8	6.935916	12	8	.55
36850.0	207.41 3	136.074 6	32.925 2	.18345 2	16.89607 6	11.08562 1	.94E-5 5	6.936463	11	8	.42
36852.0	217.3 1	129.50 3	32.93 1	.18333 9	17.0674 2	11.08564 6	-.2E-5 4	6.937447	10	8	1.81
36854.0	227.2 2	122.93 4	32.93 2	.1833 1	17.2388 3	11.0858 2	.11E-4 7	6.937701	7	8	1.21
36856.0	237.0 2	116.36 9	32.93 5	.1833 2	17.4104 3	11.0857 2	.10E-4 6	6.937574	7	8	1.87
36858.0	247.0 2	109.79 7	32.92 6	.1829 7	17.5818 5	11.0857 4	-.0E-4 2	6.941207	6	8	2.24
36860.0	256.83 7	103.18 2	32.94 2	.18328 9	17.7535 2	11.08581 5	.14E-4 3	6.937869	9	8	1.42
36862.0	266.8 1	96.60 4	32.94 2	.1833 1	17.9252 2	11.08589 8	.13E-4 8	6.938031	8	8	1.75
36864.0	276.65 9	90.04 4	32.95 2	.1833 1	18.0970 2	11.08589 6	.12E-4 5	6.93770	12	8	1.05
36866.0	286.56 4	83.45 2	32.937 8	.18326 6	18.26900 8	11.08603 2	.14E-4 3	6.937943	17	8	.94
36868.0	296.54 8	76.89 2	32.94 1	.1831 2	18.4408 2	11.0862 2	.2E-4 2	6.939052	15	8	.91
36870.0	306.38 3	70.297 9	32.934 4	.18325 4	18.61319 6	11.08611 2	.11E-4 2	6.937924	24	8	.64
36872.0	316.31 4	63.716 9	32.934 4	.18328 4	18.78541 8	11.08614 3	.14E-4 2	6.937705	21	8	.62
36874.0	326.22 3	57.13 1	32.933 3	.18334 4	18.95779 6	11.08622 2	.16E-4 1	6.937132	25	8	.52
36876.0	336.06 8	50.56 2	32.932 5	.18355 7	19.1305 2	11.08617 4	-.2E-5 4	6.93541	32	8	1.42
36878.0	346.1 1	43.95 3	32.934 4	.18374 7	19.3027 2	11.0856 1	.10E-4 3	6.933998	28	8	.92
36880.0	355.9 1	37.40 3	32.930 5	.18385 8	19.4756 2	11.08632 6	.33E-4 3	6.932789	32	8	1.27
36882.0	5.5 1	30.92 4	32.937 4	.18360 3	19.6491 2	11.08631 6	.17E-4 3	6.934916	24	8	.72
36884.0	15.63 3	24.26 1	32.932 2	.18364 2	19.82164 6	11.08649 2	.132E-4 9	6.934453	26	8	.42
36886.0	25.55 3	17.66 1	32.932 2	.18372 2	19.99465 6	11.08656 3	.13E-4 1	6.933826	20	8	.44
36888.0	35.44 4	11.08 1	32.932 3	.18379 2	20.16778 9	11.08657 4	.112E-4 7	6.933195	20	8	.55
36890.0	45.14 9	4.49 2	32.932 3	.1844 4	20.3413 1	11.08669 2	.102E-4 6	6.927693	18	8	.36
36892.0	55.04 1	357.90 8	32.93 2	.184 4	20.515 2	11.0867 3	.14E-4 8	6.929205	12	8	1.22
36894.0	65.0 2	351.29 7	32.96 3	.1842 4	20.6879 5	11.0861 6	.2E-4 1	6.93028	11	8	1.41
36896.0	75.0 1	344.84 5	32.89 3	.18405 9	20.8612 3	11.0866 2	-.8E-5 9	6.930982	9	8	1.78
36898.0	84.8 1	338.25 2	32.91 3	.18399 9	21.0348 3	11.0870 2	.20E-4 8	6.931356	9	8	2.02
36900.0	94.6 4	331.7 1	32.90 9	.1840 3	21.208 1	11.0869 4	.2E-4 1	6.931278	14	8	6.85
36902.0	104.34 4	325.08 1	32.924 4	.18403 4	21.38266 9	11.08693 1	.111E-4 1	6.930965	47	8	1.65

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36904.0	114.87 1	318.5 4	32.9 3	.187 9	21.556 2	11.0872 6	.2E-4 2	6.909769	21	8	5.15
36906.0	124.64 2	312.0 4	33.0 3	.19 1	21.730 1	11.088 1	.2E-4 3	6.892877	21	8	5.08
36908.0	134.0 1	305.29 6	32.91 3	.185 2	21.9049 4	11.0873 2	.21E-4 5	6.920147	19	8	.65
36910.0	143.81 3	298.72 1	32.903 4	.18380 3	22.07888 8	11.08707 3	.12E-4 1	6.932854	24	8	.59
36912.0	153.73 3	292.142 7	32.904 3	.18373 3	22.25307 6	11.08718 2	.6E-5 1	6.93340	23	8	.59
36914.0	163.59 3	285.570 7	32.907 2	.18366 2	22.42745 5	11.08720 1	.52E-5 7	6.934016	26	8	.52
36916.0	173.50 3	278.98 1	32.907 2	.18362 3	22.60179 6	11.08721 1	.53E-5 6	6.934373	23	8	.62
36918.0	183.40 4	272.39 1	32.908 2	.18356 4	22.77620 7	11.08721 1	.7E-5 1	6.934906	20	8	.52
36920.0	193.28 4	265.82 1	32.909 2	.18349 4	22.95069 7	11.08727 2	.4E-5 1	6.93542	24	8	.67
36922.0	203.15 4	259.24 1	32.909 4	.18338 6	23.12526 9	11.08729 3	.3E-5 2	6.936358	29	8	.89
36924.0	213.06 3	252.66 1	32.910 5	.18335 7	23.20076 8	11.08725 3	.4E-5 1	6.936618	29	8	.69
36926.0	222.98 4	246.06 2	32.916 9	.1833 1	23.47431 9	11.08726 5	.4E-5 2	6.937322	32	8	.65
36928.0	232.69 6	239.51 6	32.91 2	.1813 7	23.6488 1	11.08729 5	.8E-5 2	6.953845	34	8	1.02
36930.0	242.56 7	232.92 4	32.93 3	.1806 9	23.8234 2	11.08729 7	.8E-5 3	6.959609	30	8	1.21
36932.0	252.54 7	226.35 5	32.91 4	.180 1	23.9979 3	11.08720 9	.8E-5 3	6.961974	29	8	1.14
36934.0	262.59 3	219.76 1	32.921 5	.18318 6	24.17324 6	11.08743 2	.9E-5 2	6.937976	27	8	1.09
36936.0	272.50 5	213.18 2	32.927 8	.18318 9	24.3482 1	11.08747 3	.11E-4 2	6.938024	22	8	1.58
36938.0	282.43 5	206.60 2	32.932 9	.18322 9	24.5231 1	11.08750 3	.10E-4 2	6.937649	16	8	1.53
36940.0	292.39 5	200.07 2	32.935 6	.18333 8	24.6980 1	11.087570 6	.17E-4 2	6.936696	12	8	1.19
36942.0	302.04 7	193.45 2	32.919 6	.18310 8	24.8738 1	11.087601 5	.7E-5 2	6.938583	10	8	1.29
36944.0	316.73 3	185.25 1	32.7 2	.183 1	25.041 5	11.0875 1	-.2E-4 4	6.94186	9	8	17.44
36946.0	332.10 5	176.64 2	32.5 3	.183 2	25.207 9	11.0873 2	.4E-4 7	6.935405	7	8	18.77
36948.0	338.22 3	171.63 1	32.7 2	.183 1	25.388 2	11.0875 2	.1E-4 4	6.93740	8	8	16.77
36950.0	340.44 1	166.8 4	32.9 1	.183 1	25.579 3	11.0877 2	-.3E-4 4	6.940552	11	8	23.92
36952.0	349.66 1	161.0 3	33.0 1	.1824 9	25.756 2	11.0871 2	.3E-3 2	6.944891	10	8	22.83
36954.0	1.6 1	153.96 3	32.92 1	.1835 1	25.9261 3	11.08782 1	.11E-4 6	6.935374	13	8	3.27
36956.0	11.5 1	147.37 3	32.923 8	.1835 1	26.1020 3	11.08787 1	.10E-4 4	6.934966	19	8	2.98
36958.0	21.33 9	140.79 3	32.919 6	.1836 1	26.2778 2	11.087901 5	.8E-5 2	6.93415	25	8	2.33
36960.0	31.18 3	134.23 1	32.920 3	.18369 4	26.45368 7	11.087942 3	.112E-4 9	6.933457	39	8	1.07
36962.0	41.05 3	127.65 1	32.920 3	.18375 4	26.62963 6	11.087982 3	.11E-4 1	6.932944	43	8	1.05
36964.0	50.95 3	121.07 2	32.922 3	.18390 4	26.80559 6	11.08804 2	.14E-4 1	6.931654	40	8	.93

T (MJD)	ω	Ω	i	e	M	n	n′	a	N	D	σ
36966.0	60.80 3	114.48 2	32.926 3	.18393 4	26.98181 6	11.08814 2	.15E-4 1	6.931334	39	8	.97
36968.0	70.68 2	107.90 1	32.920 3	.18407 3	27.15803 4	11.08820 1	.151E-4 6	6.930151	34	8	.75
36970.0	80.52 2	101.33 1	32.923 3	.18407 3	27.33449 3	11.08823 2	.124E-4 4	6.930095	32	8	.63
36972.0	90.38 1	94.744 7	32.925 2	.18404 2	27.51102 2	11.088262 6	.103E-4 4	6.930375	30	8	.43
36974.0	100.24 1	88.166 7	32.924 2	.18401 2	27.68759 2	11.088301 8	.94E-5 6	6.930566	24	8	.40
36976.0	110.09 1	81.576 5	32.932 4	.18394 2	27.86431 2	11.088358 6	.68E-5 5	6.931161	20	8	.49
36978.0	119.93 5	74.99 2	32.94 2	.1838 1	28.0411 1	11.08840 3	.7E-5 3	6.932032	22	8	1.82
36980.0	129.85 3	68.46 2	32.96 1	.1840 1	28.21764 9	11.08837 4	.3E-5 3	6.93067	26	8	1.82
36982.0	139.68 2	61.87 1	32.95 1	.18391 7	28.39451 6	11.08842 3	.4E-5 1	6.931387	44	8	.87
36984.0	149.51 2	55.27 1	32.932 6	.18373 7	28.57149 5	11.08846 2	.39E-5 7	6.932904	58	8	.71
36986.0	159.34 2	48.69 1	32.934 5	.18430 3	28.7487 1	11.08848 2	.29E-5 8	6.928084	70	8	.48
36988.0	169.23 2	42.11 1	32.930 4	.1834 3	28.9252 1	11.08844 2	-.7E-6 7	6.936142	73	8	.44
36990.0	179.10 2	35.55 1	32.933 4	.1832 3	29.1020 1	11.08837 2	-.10E-5 9	6.937742	65	8	.45
36992.0	189.01 2	28.94 1	32.925 3	.1830 4	29.2788 2	11.08843 3	.1E-5 1	6.939536	58	8	.44
36994.0	198.89 2	22.38 1	32.927 3	.18338 7	29.45580 4	11.08843 2	.3E-5 1	6.935922	53	8	.55
36996.0	208.80 1	15.798 7	32.927 2	.18324 4	29.63265 2	11.088458 9	.26E-5 7	6.937049	41	8	.79
36998.0	218.68 1	9.222 5	32.928 2	.18321 4	29.80957 2	11.088474 6	.35E-5 5	6.937319	34	8	.46
37000.0	228.58 2	2.641 7	32.929 2	.18319 5	29.98651 3	11.088489 6	.24E-5 8	6.937493	20	8	.46
37002.0	238.51 2	356.050 7	32.933 2	.18332 8	30.16343 3	11.08852 1	.8E-5 2	6.936357	15	8	.44
37004.0	248.47 3	349.46 1	32.936 4	.1833 2	30.34031 9	11.08847 6	.5E-5 2	6.936241	15	8	.44
37006.0	258.4 2	342.89 5	32.94 2	.183 1	30.5171 9	11.0887 2	.9E-5 5	6.939858	13	8	.57
37008.0	268.22 2	336.31 1	32.926 3	.1830 1	30.69452 4	11.08852 1	.6E-5 1	6.93926	38	8	.73
37010.0	278.12 2	329.738 9	32.926 3	.18298 9	30.87161 3	11.088559 8	.3E-5 2	6.939269	38	8	.85
37012.0	288.02 3	323.20 1	32.916 4	.1834 1	31.04871 5	11.08860 3	.2E-5 3	6.935622	39	8	1.23
37014.0	297.89 3	316.62 1	32.910 5	.1837 2	31.22601 6	11.08871 4	.11E-4 4	6.933174	41	8	1.36
37016.0	307.80 3	310.03 2	32.92 1	.1833 1	31.40310 9	11.08864 3	.13E-4 4	6.936859	32	8	1.51
37018.0	317.73 4	303.43 2	32.92 1	.1832 1	31.58038 8	11.08869 5	-.2E-5 5	6.937059	30	8	1.76
37020.0	327.63 2	296.846 9	32.908 6	.18323 6	31.75773 3	11.08868 2	.6E-5 3	6.93706	26	8	.96
37022.0	337.49 3	290.259 8	32.913 8	.18326 6	31.93522 6	11.08876 3	.13E-4 3	6.93677	25	8	.97
37024.0	347.37 4	283.689 1	32.92 1	.18338 8	32.1127 2	11.08883 5	.21E-4 3	6.93569	24	8	.91

TABLE 4

DATA RELATED TO SOLAR EFFECTS ON ACCELERATION OF 1959 $\alpha 2$

PERIGEE IN SUNLIGHT

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36640.	0.898E-06	568.	-30.99	1.51	27.73	5.7
36642.	0.947E-06	569.	-32.49	4.44	30.26	6.2
36644.	0.947E-06	569.	-32.94	7.89	32.08	6.3
36646.	0.979E-06	569.	-32.28	11.25	33.09	6.1
36648.	0.103E-05	568.	-30.57	14.30	33.32	5.6
36650.	0.108E-05	567.	-27.91	16.84	32.81	4.7
36652.	0.126E-05	566.	-24.45	18.74	31.63	3.7
36654.	0.134E-05	564.	-20.31	20.08	29.92	2.6
36656.	0.122E-05	563.	-15.68	20.86	27.83	1.6
36658.	0.106E-05	562.	-10.69	21.21	25.60	0.7
36660.	0.954E-06	561.	-5.46	21.30	23.51	0.2
36662.	0.930E-06	560.	-0.12	21.21	21.87	0.0
36664.	0.897E-06	559.	5.24	21.15	21.06	0.2
36666.	0.962E-06	559.	10.49	21.22	21.29	0.7
36668.	0.116E-05	559.	15.46	21.52	22.49	1.5
36670.	0.103E-05	559.	20.09	22.24	24.51	2.5
36672.	0.104E-05	560.	24.21	23.43	27.00	3.6
36674.	0.111E-05	561.	27.70	25.22	29.74	4.6
36676.	0.109E-05	561.	30.40	27.64	32.49	5.5
36678.	0.106E-05	562.	32.17	30.53	35.06	6.1
36680.	0.106E-05	561.	32.89	33.77	37.36	6.3
36682.	0.109E-05	561.	32.53	37.04	39.32	6.2
36684.	0.117E-05	560.	31.10	40.07	40.90	5.7
36686.	0.121E-05	560.	28.70	42.63	42.13	4.9
36688.	0.114E-05	559.	25.44	44.60	43.12	3.9
36690.	0.104E-05	560.	21.51	45.95	43.94	2.9
36692.	0.913E-06	559.	17.01	46.76	44.79	1.8
36694.	0.913E-06	559.	12.12	47.11	45.76	0.9
36696.	0.913E-06	558.	6.93	47.15	47.06	0.3
36698.	0.945E-06	559.	1.62	46.98	48.75	0.0
36700.	0.962E-06	559.	-3.75	46.77	50.92	0.1
36702.	0.114E-05	559.	-9.00	46.57	53.49	0.5
36704.	0.103E-05	563.	-14.07	46.64	56.53	1.3
36706.	0.103E-05	567.	-18.80	47.05	59.87	2.3
36708.	0.782E-06	573.	-23.12	48.00	63.50	3.3
36710.	0.799E-06	570.	-26.85	49.65	67.27	4.4
36712.	0.603E-06	566.	-29.80	51.88	70.93	5.3
36714.	0.538E-06	566.	-31.83	54.54	74.24	6.0
36716.	0.438E-06	568.	-32.83	57.60	77.14	6.3
36718.	0.358E-06	567.	-32.73	60.77	79.48	6.3

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36720.	0.367E-06	567.	-31.55	63.78	81.14	5.9
36722.	0.342E-06	567.	-29.34	66.37	82.04	5.2
36724.	0.479E-06	566.	-26.26	68.38	82.15	4.2
36726.	0.440E-06	565.	-22.43	69.77	81.49	3.1
36728.	0.494E-06	561.	-18.03	70.56	80.13	2.1
36730.	0.546E-06	560.	-13.20	70.87	78.21	1.1
36732.	0.603E-06	558.	-8.07	70.83	75.89	0.4
36734.	0.665E-06	557.	-2.76	70.55	73.35	0.1
36736.	0.647E-06	557.	2.60	70.20	70.81	0.0
36738.	0.644E-06	557.	7.91	69.91	68.48	0.4
36740.	0.717E-06	556.	13.05	69.85	66.56	1.1
36742.	0.635E-06	556.	17.90	70.13	65.23	2.0
36744.	0.652E-06	557.	22.30	70.86	64.59	3.1
36746.	0.700E-06	558.	26.13	72.16	64.71	4.2
36748.	0.652E-06	562.	29.25	74.09	65.62	5.1
36750.	0.766E-06	565.	31.47	76.53	67.16	5.8
36752.	0.603E-06	566.	32.71	79.36	69.24	6.3
36754.	0.603E-06	567.	32.87	82.18	71.56	6.3
36756.	0.423E-06	558.	31.93	85.54	74.64	6.0
36758.	0.407E-06	557.	29.99	88.13	77.46	5.3
36760.	0.521E-06	557.	27.13	90.26	80.28	4.4
36762.	0.423E-06	557.	23.49	91.77	82.94	3.4
36764.	0.586E-06	548.	19.14	92.92	85.61	2.3
36766.	0.619E-06	547.	14.39	93.39	87.87	1.3
36768.	0.554E-06	550.	9.41	93.30	89.68	0.6
36770.	0.440E-06	556.	4.23	93.00	91.31	0.1
36772.	0.440E-06	549.	-1.25	92.94	93.19	0.0
36774.	0.423E-06	564.	-6.31	92.38	94.37	0.3
36776.	0.261E-06	560.	-11.76	92.63	96.33	0.9
36778.	0.326E-06	560.	-16.62	92.74	97.84	1.8
36780.	0.375E-06	560.	-21.16	93.51	99.72	2.8
36782.	0.423E-06	562.	-25.18	94.84	101.78	3.9
36784.	0.342E-06	564.	-28.51	96.81	104.06	4.9
36786.	0.358E-06	565.	-31.00	99.35	106.47	5.7
36788.	-0.163E-06	577.	-32.54	102.64	109.21	6.2
36790.	0.277E-06	571.	-32.95	105.71	111.54	6.3
			PERIGEE IN EARTH SHADOW			
36792.	0.277E-06	568.	-32.24	108.94	113.91	6.1
36794.	0.277E-06	566.	-30.50	111.86	116.04	5.5
36796.	0.326E-06	565.	-27.81	114.35	117.84	4.7
36798.	0.322E-06	563.	-24.33	116.18	119.12	3.6
36800.	0.293E-06	561.	-20.19	117.44	119.87	2.5
36802.	0.423E-06	559.	-15.57	118.14	120.04	1.5
36804.	0.326E-06	558.	-10.54	118.50	119.74	0.7
36806.	0.423E-06	558.	-5.28	118.56	119.00	0.2
36808.	0.423E-06	557.	0.09	118.50	118.01	0.0
36810.	0.505E-06	556.	5.45	118.43	116.88	0.2

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36812.	0.602E-06	552.	10.68	118.49	115.82	0.7
36814.	0.602E-06	552.	15.65	118.83	115.01	1.6
36816.	0.553E-06	552.	20.28	119.69	114.69	2.6
36818.	0.472E-06	553.	24.39	120.90	114.74	3.7
36820.	0.391E-06	557.	27.86	122.80	115.49	4.7
36822.	0.335E-06	558.	30.52	125.31	116.90	5.5
36826.	0.277E-06	559.	32.89	131.72	121.71	6.3
36828.	0.342E-06	559.	32.47	135.00	124.84	6.2
36830.	0.277E-06	558.	30.99	138.05	128.35	5.7
36832.	0.326E-06	558.	28.53	140.64	132.07	4.9
36834.	0.374E-06	558.	25.23	142.68	135.82	3.9
36836.	0.358E-06	556.	21.26	144.08	139.25	2.8
36838.	0.309E-06	556.	16.71	145.02	142.27	1.8
36840.	0.326E-06	556.	11.77	145.49	144.43	0.9
36842.	0.309E-06	556.	6.56	145.63	145.55	0.3
36844.	0.342E-06	556.	1.23	145.59	145.54	0.0
36846.	0.200E-06	557.	-4.14	145.52	144.52	0.1
36848.	0.182E-06	558.	-9.42	145.55	142.71	0.6
36850.	0.153E-06	559.	-14.49	145.83	140.45	1.4
36852.	-0.325E-07	561.	-19.23	146.49	138.06	2.3
36854.	0.179E-06	563.	-23.51	147.67	135.81	3.4
36856.	0.163E-06	564.	-27.12	149.33	133.88	4.5
36858.	-0.651E-01	568.	-30.02	151.81	132.58	5.4
36860.	0.228E-06	566.	-31.97	154.57	131.82	6.0
36862.	0.212E-06	566.	-32.88	157.88	131.89	6.3
36864.	0.195E-06	566.	-32.70	161.15	132.68	6.2
36866.	0.228E-06	565.	-31.41	164.26	134.26	5.8
36868.	0.325E-06	566.	-29.11	167.03	136.59	5.1
36870.	0.179E-06	564.	-25.96	169.03	139.48	4.1
36872.	0.228E-06	562.	-22.06	170.51	142.96	3.0
36874.	0.260E-06	561.	-17.59	171.39	146.86	2.0
36876.	-0.325E-07	558.	-12.74	171.72	151.00	1.0
36878.	0.163E-06	556.	-7.50	171.84	155.44	0.4
36880.	0.537E-06	554.	-2.23	171.59	159.70	0.0
36882.	0.277E-06	557.	2.99	171.16	163.63	0.1
36884.	0.215E-06	557.	8.42	171.08	167.48	0.5
36886.	0.212E-06	557.	13.56	171.09	170.36	1.2
36888.	0.182E-06	557.	18.37	171.45	171.89	2.1
36890.	0.166E-06	552.	22.67	172.09	171.75	3.2
36892.	0.228E-06	555.	26.46	173.49	170.80	4.3
36894.	0.325E-06	557.	29.54	175.52	169.56	5.2
36896.	-0.130E-06	559.	31.64	178.33	168.62	5.9
36898.	0.325E-06	559.	32.76	181.13	167.96	6.3
36900.	0.325E-06	559.	32.78	184.11	167.80	6.3
36902.	0.181E-06	559.	31.78	186.82	168.05	5.9
36904.	0.325E-06	537.	29.52	190.05	168.12	5.3
36906.	0.325E-06	519.	26.62	191.96	168.21	4.3
36908.	0.342E-06	545.	23.01	192.60	168.37	3.3
36910.	0.195E-06	557.	18.71	193.28	166.98	2.2
36912.	0.976E-07	556.	13.91	193.57	164.36	1.2

T (MJD)	$-\dot{P}$	Z	Φ	D.R.A.	ψ	C (km)
36914.	0.846E-07	556.	8.83	193.42	160.86	0.5
36916.	0.862E-07	556.	3.53	193.05	156.66	0.1
36918.	0.114E-06	557.	-1.85	192.57	152.06	0.0
36920.	0.651E-07	557.	-7.17	192.13	147.25	0.3
36922.	0.488E-07	559.	-12.33	191.87	142.41	1.0
36924.	0.651E-07	560.	-17.24	191.98	137.67	1.9
36926.	0.651E-07	562.	-21.74	192.54	133.20	3.0
36928.	0.130E-06	579.	-25.60	193.51	129.28	4.0
36930.	0.130E-06	586.	-28.85	195.19	125.81	5.0
36932.	0.130E-06	589.	-31.22	197.60	123.00	5.8
36934.	0.146E-06	566.	-32.61	200.53	120.94	6.2
36936.	0.179E-06	566.	-32.89	203.53	119.83	6.3
36938.	0.163E-06	565.	-32.07	206.48	119.62	6.0
36940.	0.277E-06	564.	-30.18	209.19	120.30	5.4
36942.	0.114E-06	565.	-27.43	210.94	122.00	4.5
36944.	-0.325E-06	566.	-21.73	215.47	124.25	3.5
36946.	0.651E-06	558.	-14.56	219.01	127.30	2.4
36948.	0.163E-06	560.	-11.56	217.32	130.75	1.4
36950.	-0.488E-06	563.	-10.48	212.32	135.30	0.6
36952.	0.488E-05	567.	-5.61	212.29	138.87	0.1
36954.	0.179E-06	557.	0.87	213.17	142.27	0.0
36956.	0.163E-06	557.	6.22	212.81	145.39	0.2
36958.	0.130E-06	557.	11.40	212.59	147.66	0.8
36960.	0.182E-06	557.	16.34	212.72	148.75	1.7
36962.	0.179E-06	557.	20.91	213.31	148.56	2.7
36964.	0.228E-06	557.	24.97	214.48	147.17	3.8
36966.	0.244E-06	558.	28.33	216.21	144.95	4.8
36968.	0.246E-06	557.	30.85	218.58	142.14	5.6
36970.	0.202E-06	558.	32.42	221.41	139.13	6.2
36972.	0.168E-06	558.	32.92	224.52	136.15	6.3
36974.	0.153E-06	558.	32.34	227.65	133.36	6.1
36976.	0.111E-06	558.	30.70	230.48	130.92	5.6
36978.	0.114E-06	558.	28.11	232.83	128.88	4.7
36980.	0.488E-07	556.	24.69	234.74	127.14	3.7
36982.	0.651E-07	556.	20.61	235.91	125.92	2.6
36984.	0.634E-07	556.	16.01	236.53	125.03	1.6
36986.	0.472E-07	550.	11.06	236.77	124.33	0.8
36988.	-0.114E-07	558.	5.83	236.77	123.67	0.2
36990.	-0.163E-07	559.	0.49	236.63	122.98	0.0
36992.	0.163E-07	561.	-4.88	236.47	122.14	0.2
36994.	0.488E-07	558.	-10.14	236.47	121.02	0.7
36996.	0.423E-07	560.	-15.18	236.77	119.58	1.5
36998.	0.569E-07	561.	-19.86	237.46	117.82	2.5
37000.	0.390E-07	563.	-24.06	238.69	115.75	3.6
37002.	0.130E-06	563.	-27.62	240.56	113.40	4.6

PERIGEE IN SUNLIGHT

T (MJD)	-P	Z	Φ	D.R.A.	ψ	C (km)
37004.	0.813E-07	563.	-30.38	243.07	110.88	5.5
37006.	0.146E-06	568.	-32.18	246.10	108.33	6.1
37008.	0.976E-07	567.	-32.91	249.31	105.99	6.3
37010.	0.488E-07	567.	-32.55	252.67	103.74	6.2
37012.	0.325E-07	563.	-31.11	255.85	101.75	5.7
37014.	0.179E-06	560.	-28.70	258.49	100.16	4.9
37016.	0.211E-06	562.	-25.43	260.59	98.90	3.9
37018.	-0.325E-07	562.	-21.44	262.09	98.00	2.9
37020.	0.976E-07	560.	-16.91	263.01	97.42	1.8
37022.	0.211E-06	559.	-12.01	263.44	97.10	0.9
37024.	0.342E-06	558.	-6.82	263.58	96.85	0.3

FIGURE 1. -- The acceleration of Satellite 1959 $\alpha 1$.

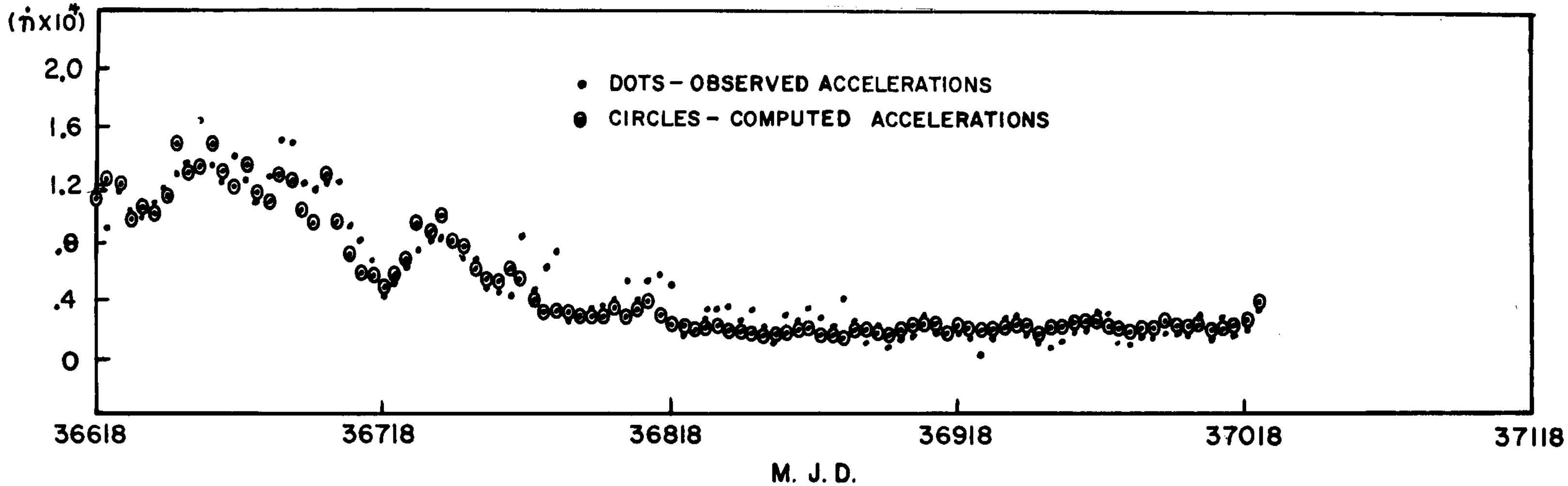


FIGURE 2. -- Satellite 1959 $\alpha 1$. Residuals in the mean motion as a quadratic.

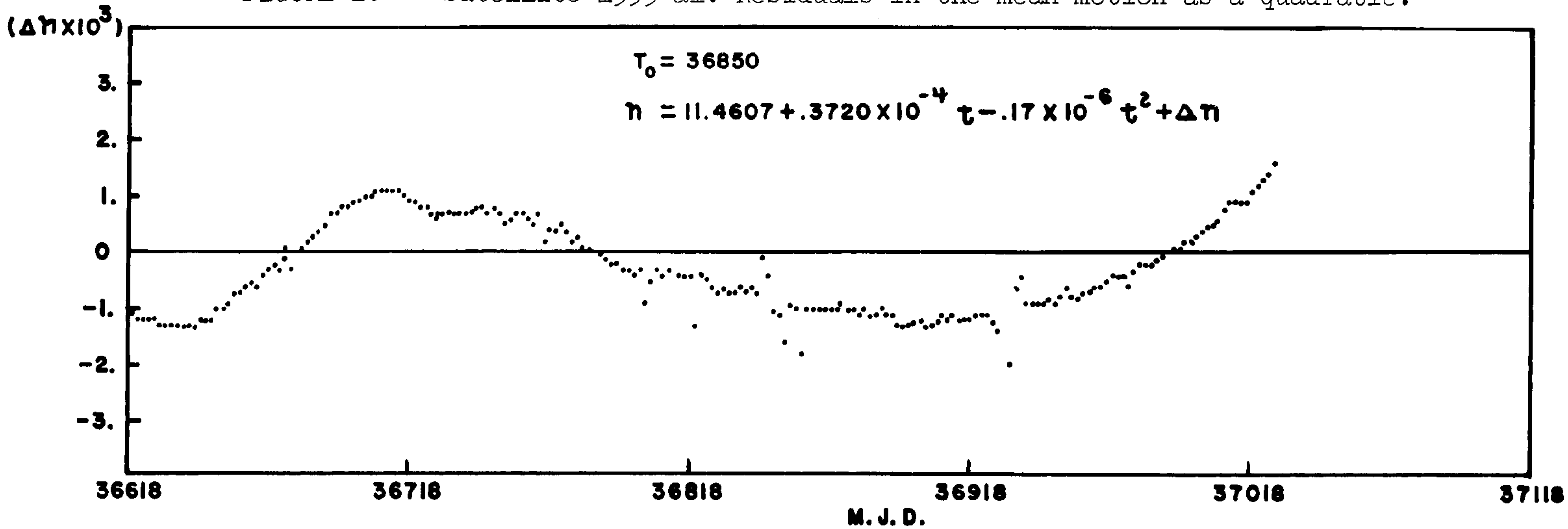


FIGURE 3. -- Satellite 1959 $\alpha 1$. The angle between the perigee and the sun.

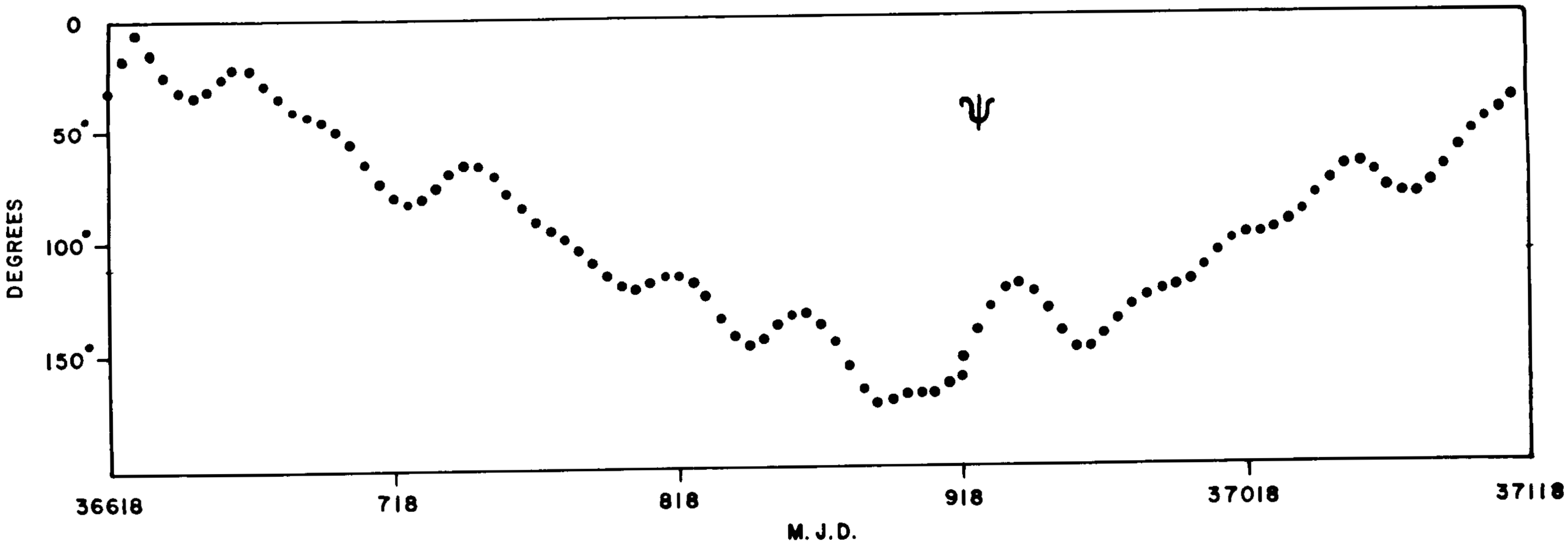


FIGURE 4. -- Satellite 1959 $\alpha 1$. The latitude of the perigee.

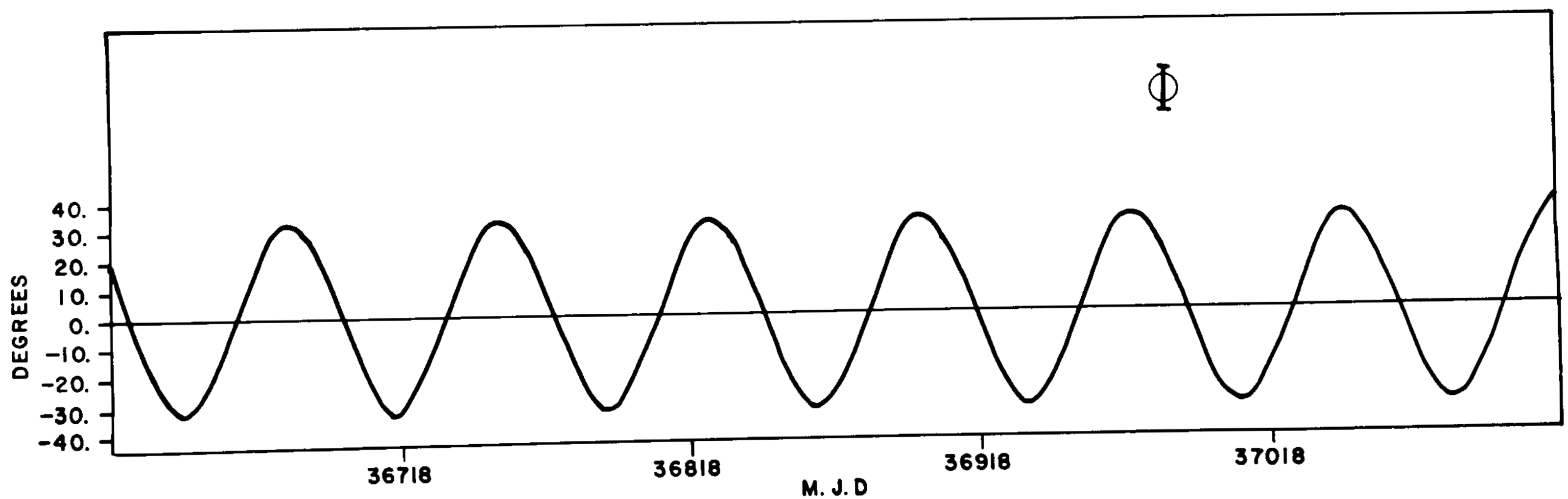


FIGURE 5. -- Satellite 1959 α1. The correction required to derive the true altitude of the perigee over the international ellipsoid.

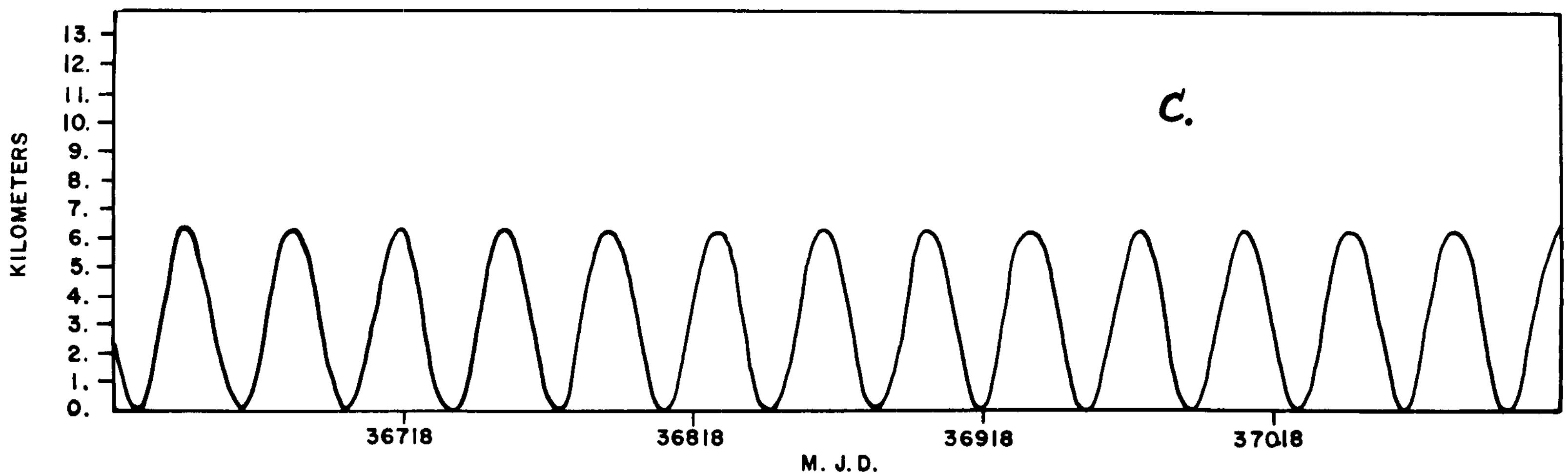


FIGURE 6. -- The 20 cm solar flux (10^{-22} watts/M^2/cycle)

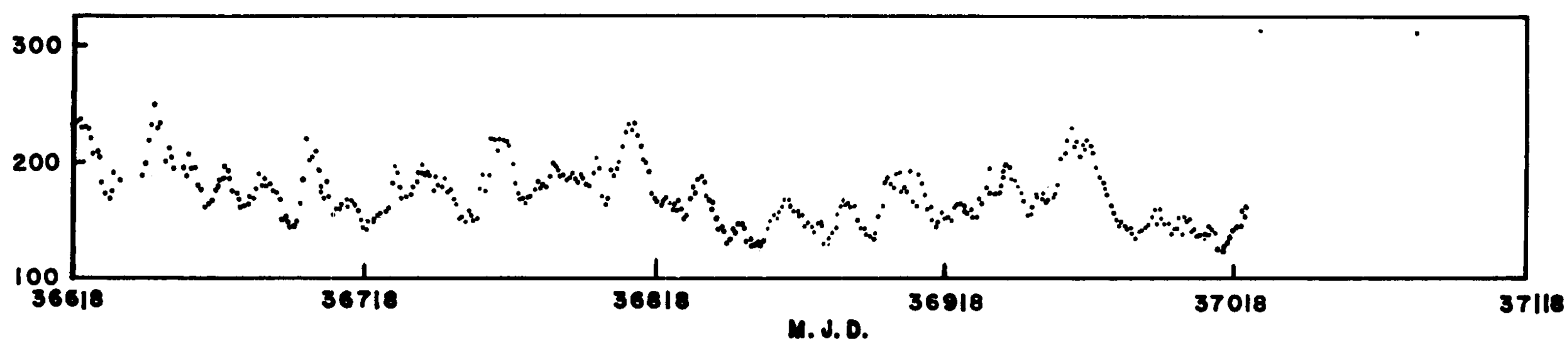


FIGURE 7. -- The acceleration of Satellite 1959 $\alpha 2$.

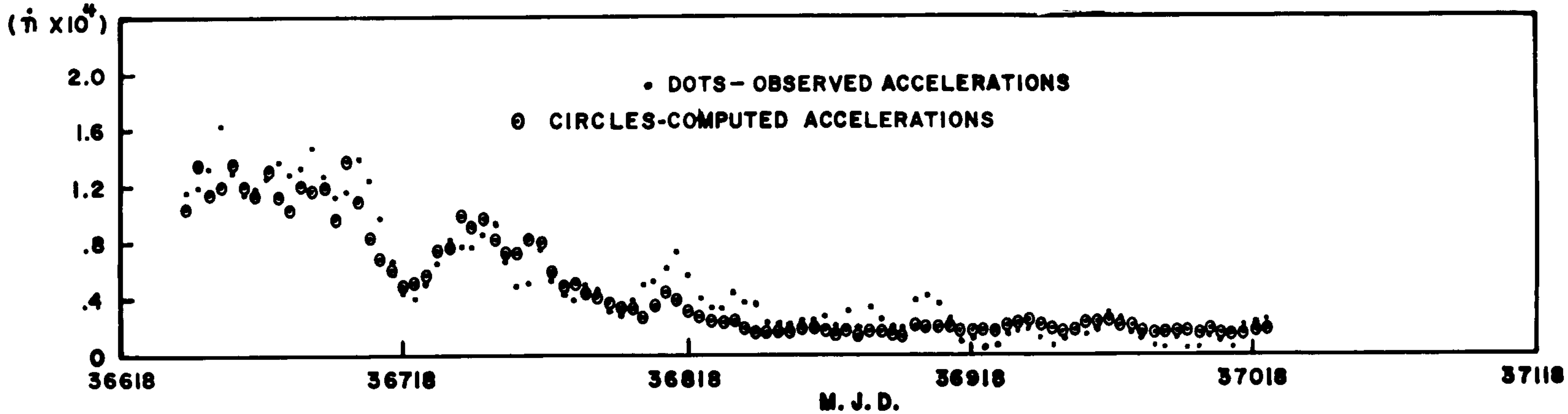


FIGURE 8. -- Satellite 1959 $\alpha 2$. The angle between the perigee and the sun.

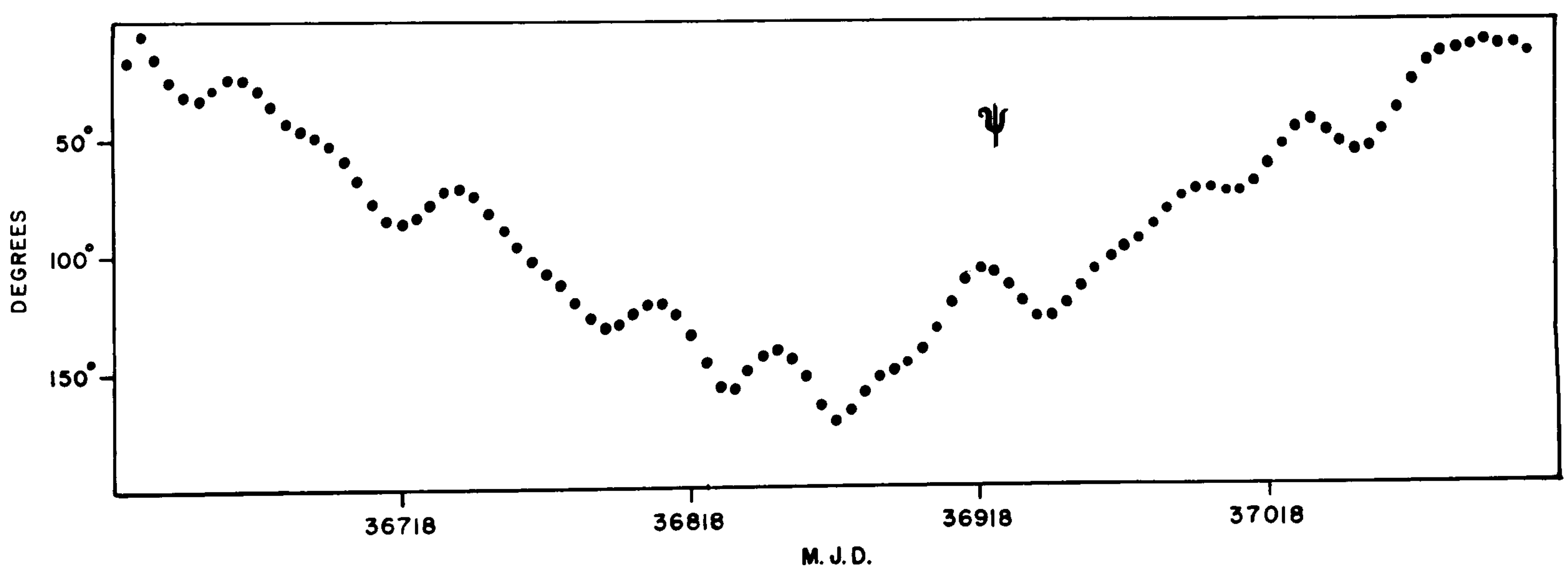


FIGURE 9. -- Satellite 1959 $\alpha 2$. The latitude of the perigee.

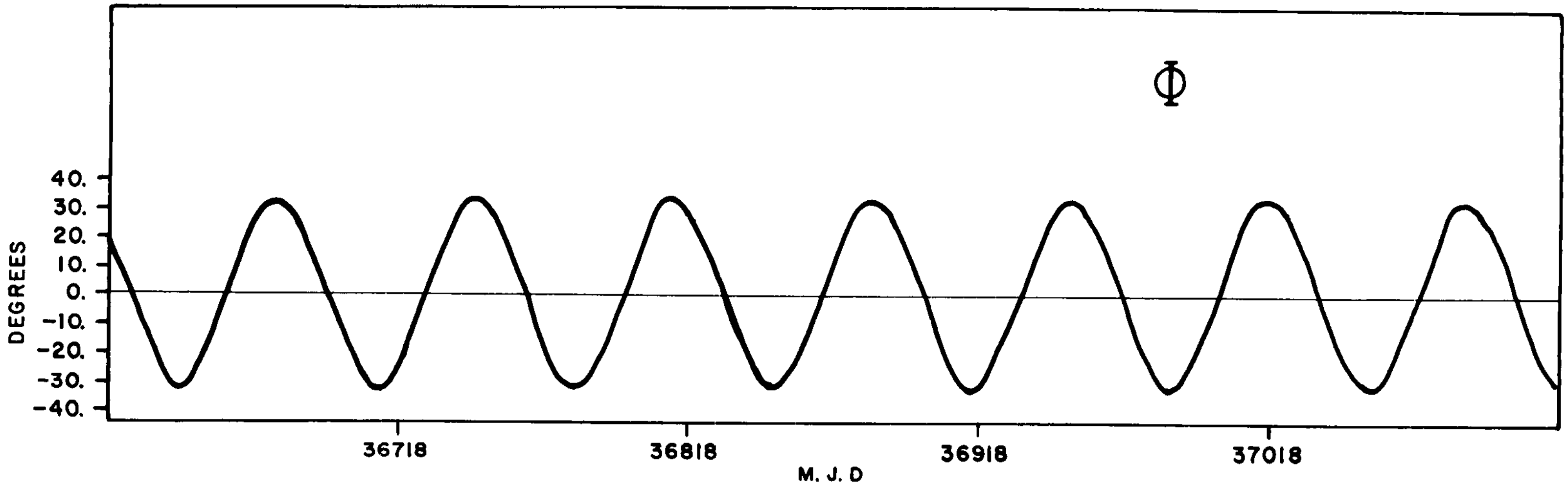
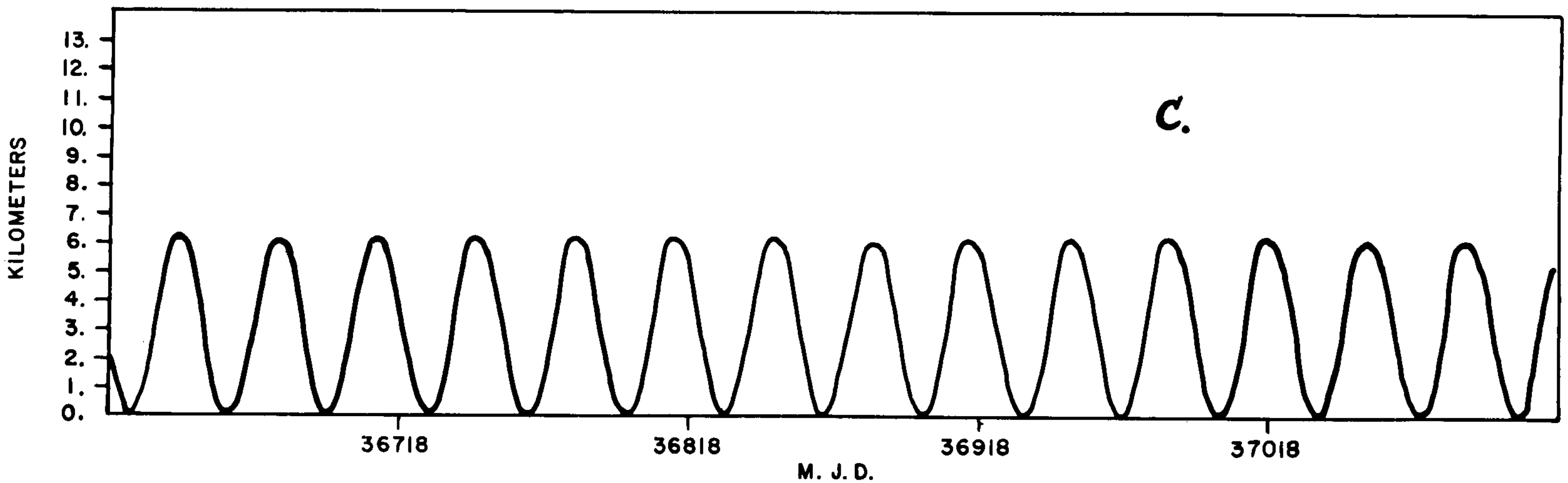


FIGURE 10. -- Satellite 1959 $\alpha 2$. The correction required to derive the true altitude of the perigee over the international ellipsoid.



Errata for SAO Special Report No. 51

Line 16 on page 17 should read

$$i = (50^{\circ}3019 \pm 27) \underline{- {}^{\circ}20 \times 10^{-2} \sin \omega}$$

Line 18 on page 17 should read

$$M = (.40687 \pm 13) + (14.216028 \pm 15)\, t + (.12286 \pm 67) \times 10^{-4} t^2 - (.312 \pm 68) \times 10^{-6} t^3$$

Line 28 on page 17 should read

$$M = (.88910 \pm 23) + (14.216786 \pm 22)\, t + (.2554 \pm 11) \times 10^{-4} t^2 + (.1433 \pm 86) \times 10^{-6} t^3$$

For page 10 of SAO Special Report No. 51, substitute the following:

TABLE 2

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1958 $\beta 2$

T (MJD)	ω	Ω	Ψ	$\Delta\alpha$	φ	C (km)
36814.	324.89	340.78	148.26	149.31	-18.89	2.3
36818.	342.54	328.71	149.35	149.21	-9.72	0.6
36822.	0.18	316.63	147.91	148.26	0.10	0.0
36826.	17.82	304.56	144.83	147.32	9.91	0.6
36830.	35.44	292.48	141.63	147.25	19.04	2.3
36834.	53.05	280.41	139.62	148.82	26.72	4.3
36838.	70.65	268.33	139.70	152.43	32.06	6.1
36842.	88.26	256.25	142.31	157.65	34.22	6.8
36846.	105.86	244.17	147.46	163.01	32.77	6.3
36850.	123.46	232.09	154.67	166.96	27.99	4.7
36854.	141.08	220.01	162.87	168.83	20.70	2.7
36858.	158.70	207.93	168.71	168.91	11.79	0.9
36862.	176.33	195.85	165.41	167.91	2.06	0.0
36866.	193.98	183.77	156.37	166.70	-7.81	0.4
36870.	211.64	171.69	146.75	166.14	-17.17	1.9
36874.	229.30	159.62	138.34	167.05	-25.26	3.9
36878.	246.98	147.54	132.13	169.96	-31.20	5.8
36882.	264.66	135.46	128.79	174.64	-34.08	6.7
36886.	282.34	123.39	128.67	179.78	-33.35	6.5
36890.	300.03	111.31	131.71	183.73	-29.16	5.1
36894.	317.70	99.23	137.47	185.57	-22.26	3.1
36898.	335.37	87.15	145.26	185.46	-13.56	1.2
36902.	353.03	75.07	154.28	184.09	-3.92	0.1
36906.	10.68	62.98	163.72	182.32	5.98	0.2
36910.	28.31	50.90	172.80	181.03	15.48	1.5
36914.	45.94	38.81	178.72	181.05	23.85	3.5
36918.	63.56	26.72	172.52	183.02	30.25	5.5
36922.	81.18	14.64	168.01	186.89	33.78	6.6
36926.	98.79	2.55	165.51	191.59	33.78	6.6
36930.	116.41	350.46	164.58	195.46	30.26	5.5
36934.	134.03	338.37	164.02	197.41	23.86	3.5
36938.	151.66	326.28	162.04	197.42	15.49	1.5
36942.	169.30	314.19	157.49	196.10	5.99	0.2
36946.	186.96	302.10	150.83	194.30	-3.91	0.1
36950.	204.62	290.01	143.22	192.89	-13.56	1.2
36954.	222.30	277.93	135.79	192.74	-22.26	3.1
36958.	239.99	265.84	129.59	194.54	-29.17	5.1
36962.	257.68	253.75	125.47	198.44	-33.36	6.5
36966.	275.37	241.67	124.07	203.54	-34.08	6.7
36970.	293.07	229.58	125.62	208.17	-31.19	5.8
36974.	310.76	217.49	129.89	211.02	-25.23	3.9
36978.	328.44	205.40	136.14	211.87	-17.13	1.9
36982.	346.12	193.31	143.15	211.26	-7.76	0.4
36986.	3.78	181.22	149.04	209.99	2.13	0.0
36990.	21.44	169.12	151.43	208.94	11.87	0.9
36994.	39.08	157.03	149.09	208.97	20.78	2.7
36998.	56.71	144.93	143.50	210.81	28.06	4.8
37002.	74.34	132.83	137.03	214.74	32.80	6.3
37006.	91.97	120.73	131.41	220.07	34.21	6.8
37010.	109.60	108.63	127.61	225.23	32.01	6.0
37014.	127.23	96.53	126.02	228.77	26.61	4.3
37018.	144.87	84.43	126.50	230.25	18.89	2.3
37022.	162.52	72.34	128.41	230.11	9.73	0.6
37026.	180.18	60.24	130.72	229.11	-0.10	0.0
37030.	197.86	48.14	132.27	228.12	-9.94	0.6
37034.	215.54	36.04	132.14	228.02	-19.10	2.3
37038.	233.24	23.95	130.12	229.57	-26.80	4.4
37042.	250.94	11.85	126.70	233.19	-32.14	6.1

NOTICE

This series of Special Reports was instituted under the supervision of Dr. F. L. Whipple, Director of the Astrophysical Observatory of the Smithsonian Institution, shortly after the launching of the first artificial earth satellite on October 4, 1957. Contributions come from the Staff of the Observatory. First issued to ensure the immediate dissemination of data for satellite tracking, the Reports have continued to provide a rapid distribution of catalogues of satellite observations, orbital information, and preliminary results of data analyses prior to formal publication in the appropriate journals.

Edited and produced under the supervision of Mrs. L. G. Boyd and Mr. E. N. Hayes, the Reports are indexed by the Science and Technology Division of the Library of Congress, and are regularly distributed to all institutions participating in the U.S. space research program and to individual scientists who request them from the Administrative Officer, Technical Information, Smithsonian Astrophysical Observatory, Cambridge 38, Massachusetts.

The work reported in this series is supported, in part, through grants from the National Science Foundation and the National Aeronautics and Space Administration, and contracts with the Army Ballistic Missile Agency.